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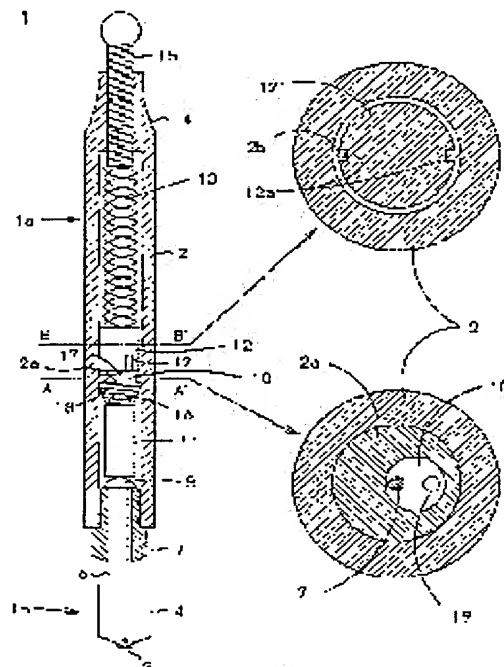
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(54) CUTTER FOR CUTTING BRITTLE MATERIAL, SCRIBER USING THE SAME AND SCRIBING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To overcome the problem that a perpendicular crack effective in terms of a scribing start point is not obtainable because of the difficulty in setting a suitable scribing pressure from the beginning of the start of scribing.

SOLUTION: A cutter head (1b) is freely vertically movably held and is kept energized downward by a coil spring (13). When the cutter head is pushed in to the prescribed amount by overcoming the energization of the coil spring, the deformation of the coil spring is instantaneously released by trigger machines (11 and 12) so that impact force is transferred to a knife blade (3) of the cutter head by the restitutive force of the coil spring.



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CLAIMS

[Claim(s)]

[Claim 1] It is the cutter for brittle material cutting characterized by that said cylinder part holds said support shaft possible [sliding of order] in the cutter possessing the cylinder part (2) which contains the support shaft (6) which supports the cutting edge for brittle material cutting (3), and said cutting edge, and said support shaft, and said cylinder part possessing a trigger generating means and an impact impression means in the interior.

[Claim 2] Said trigger generating means consists of an elastic body (13), a weight body (12) which has a crevice, and a cone configuration object (16). It operates by getting into said crevice where said support shaft carried out specified quantity migration within said cylinder part, and said some of cone configuration objects were prepared in said weight body, in case said cylinder part is grasped at the time of cutting initiation and said cutting edge is forced on a cut member, The cutter for brittle material cutting given in the 1st term of a claim characterized by transmitting an impact to said cutting edge through said support shaft because said weight body returns to an initial position according to an operation of an elastic body in an instant in case said impact impression means consists of said weight body and said trigger generating means operates.

[Claim 3] Said trigger generating means consists of an elastic body (35) which controls migration of the 1st attraction member (33), the 2nd attraction member (34), and the 1st attraction member. In order to force said cutting edge on a cut member at the time of cutting initiation, when grasping said cylinder part, sliding said support shaft and said 1st attraction member separates from the 2nd attraction member in an instant In case operating and said impact impression means consist of a stop means (32) and said trigger generating means operates The cutter for brittle material cutting given in the 1st term of a claim characterized by transmitting an impact to said cutting edge through said support shaft because said 1st attraction member returns to an initial position according to an operation of said elastic body in an instant.

[Claim 4] The cutter for brittle material cutting according to claim 3 characterized by establishing the Ayr installation means in said cylinder part, giving a piston function to said 2nd attraction member (34), and setting predetermined scribe ** as adjustable with air pressure.

[Claim 5] The scribe characterized by providing the cutter for brittle material cutting according to claim 1 to 3 in a cutter head (110) in the circular which keeps winding a brittle material substrate circularly.

[Claim 6] The scribe which lays a brittle material substrate on a table (82), is made to carry out one revolution (88) of arms for a preparation, and is characterized by providing the cutter for brittle material cutting according to claim 1 to 3 in a cutter head (110) in the **** end which keeps winding said brittle material substrate circularly.

[Claim 7] The scribe characterized by providing the cutter for brittle material cutting according to claim 1 to 3 in a cutter head (110) in the variant end cutting machine which keeps winding a brittle material substrate in the form of a free closed contour by making an arm (92) into a joint device.

[Claim 8] The scribe characterized by providing a brittle material cutting cutter according to claim 4 in said cutter head (120) in the automatic glass scribe of a device which a cutter head moves to the brittle material substrate laid in the table in X and the direction of Y relatively so much.

[Claim 9] The scribe which lays a brittle material substrate on a table (131), is made to carry out one revolution (136) of revolving arms by the motor (137), and is characterized by providing the cutter for

brittle material cutting according to claim 4 in a cutter head (140) in the automatic circular scriber which keeps winding said brittle material substrate circularly.

[Claim 10] In the scribe approach using the cutter possessing the cylinder part (2) which contains the support shaft (6) which supports the cutting edge for brittle material cutting (3), and said cutting edge, and said support shaft Said cylinder part possesses a trigger generating means and an impact impression means in the interior, In case a cutting edge is pressed to a processed brittle material, said support shaft is slid within said cylinder part and only predetermined movement magnitude is moved When scribe ** impressed to said processed brittle material is made to increase continuously and only predetermined movement magnitude moves, while predetermined scribe ** occurs The scribe approach of the brittle material characterized by for said trigger means operating, and for the impulse force of predetermined magnitude being given to a cutting edge by the actuation with said impact impression means, and carrying out a scribe in said predetermined scribe ** succeedingly after that.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the cutter used in order to cut especially glass about the cutter used in order to cut a brittle material.

[0002]

[Description of the Prior Art] First, the case of glass is explained to an example about cutting of a brittle material. As an approach of cutting glass, the following are used widely. that is, it is the diamond cutter which has the chip of a diamond, and a wheel cutter made from cemented carbide, a glass front face is lengthened and scratched (it is called a scribe), a crack is generated near a glass front face, and the bending moment, impulse force, etc. are acted along with the crack -- making -- the interior of glass -- it is the approach of growing up a crack deeply and dividing.

[0003] For example, the glass cutter 100 with a wheel shows the situation when generating a crack to a glass plate 101 at drawing 19 . If a forcing pressure exceeds the critical value of the stress-strain diagram of glass when the wheel 3 made from cemented carbide is forced on a glass front face, a crack 102 will arise perpendicularly in the plate surface which is the pressure direction. This is called vertical crack. If this vertical crack grows, it grows up to the opposite hand of a glass plate and it reaches, a glass plate 101 will be divided.

[0004] When a forcing pressure is large, also horizontally, the crack 103 of the shape of a character of 8 arises. This is called level crack. If a level crack occurs, when it extends, a forcing pressure will be offset and expansion of a vertical crack important for fragmentation will be checked. Moreover, surface glass will separate and cut and will become powder.

[0005] Therefore, when carrying out the scribe of the glass front face by the glass cutter, it is important to make it a level crack not occur.

[0006] As a factor which affects this scribe, there is the following typically.

(1) Cutter : it is ((the diameter of a wheel: in the case of a wheel cutter) 2) whenever [class, construction material, and tool angle]. Glass: The property near a front face, a glass presentation, and residual stress (3) Scribe conditions: An edge-of-a-blade load and scribe rate (4) Environment: Existence of the temperature of an ambient atmosphere, humidity, and a cutter oil [0007] In order to divide a thick glass plate to accuracy, it is necessary to obtain a deep vertical crack. For that, it is good to enlarge whenever [tool angle] and to enlarge an edge-of-a-blade load. Moreover, in the case of a wheel cutter, it is also effective to enlarge the diameter of a wheel.

[0008]

[Problem(s) to be Solved by the Invention] Now, in case it has a glass cutter by hand and the scribe of the glass front face is carried out, it is common for the time of scribe initiation not to be enough as the load applied to the edge of a blade. For this reason, that an effective vertical crack cannot be obtained often arises. A scribe part without generating of this effective vertical crack will be called an "empty end part" on these descriptions. At the time of this empty end, the Chile Chile sound peculiar to a scribe accompanying vertical crack initiation is not generated.

[0009] When the effective vertical crack was not obtained by the scribe start point, for example bending stress was given and divided to a glass plate, this part that beginning cuts could not divide to accuracy, but there was nonconformity that the fragmentation remaining part of the glass called an angle (**)

occurred. It was difficult to obtain an effective vertical crack from a scribe start point to the ultra-thin glass plate used [especially] for a liquid crystal display panel etc.

[0010] This invention aims at offering the cutter for brittle material ***** which can generate an effective vertical crack from a scribe start point by the easy device. Moreover, also let it be the object to offer the approach of generating and carrying out the scribe of the effective vertical crack from the time of the scriber using the cutter, and scribe initiation.

[0011]

[Means for Solving the Problem] In the cutter possessing the cylinder part (2) which contains the support shaft (6) with which the cutter for brittle cutting of this invention supports the cutting edge for brittle material cutting (3), and said cutting edge, and said support shaft, said cylinder part is characterized by to hold said support shaft possible [sliding of order] and said cylinder part possessing a trigger generating means and an impact impression means in the interior.

[0012] And said trigger generating means consists of an elastic body (13), a weight body (12) which has a crevice, and a cone configuration object (16). It operates by getting into said crevice where said support shaft carried out specified quantity migration within said cylinder part, and said some of cone configuration objects were prepared in said weight body, in case said cylinder part is grasped at the time of cutting initiation and said cutting edge is forced on a cut member, In case said impact impression means consists of said weight body and said trigger generating means operates, it is characterized by transmitting an impact to said cutting edge through said support shaft because said weight body returns to an initial position according to an operation of said elastic body in an instant.

[0013] Moreover, said trigger generating means consists of an elastic body (35) which controls migration of the 1st attraction member (33), the 2nd attraction member (34), and the 1st attraction member. In order to force said cutting edge on a cut member at the time of cutting initiation, when grasping said cylinder part, sliding said support shaft and said 1st attraction member separates from the 2nd attraction member in an instant In case operating and said impact impression means consist of a stop means (32) and said trigger generating means operates, it is characterized by transmitting an impact to said cutting edge through said support shaft because said 1st attraction member returns to an initial position according to an operation of said elastic body in an instant.

[0014] Further, The Ayr installation means is established in said cylinder part, a piston function is given to said 2nd attraction member (34), and it is characterized by setting predetermined scribe ** as adjustable with air pressure.

[0015] The above-mentioned trigger generating means uses whether they are that some cone configuration objects (16) get into the crevice of a weight body (12), that the 1st attraction member (33) and the 2nd attraction means (34) separate in an instant, that the 1st attraction member (43) and the 2nd attraction member separate in an instant, and *****.

[0016] The above-mentioned impact seal-of-approval means uses whether they are that a weight body (12) or the 1st attraction member (33) returns to initial value according to an operation of an elastic body in an instant, that the 1st stop member (32) makes it collide with the 1st attraction member (43), and *****.

[0017] Although a coil spring, a compression spring, etc. are mainly used as an elastic body, you may be the rubber material and resin of a low degree of hardness.

[0018]

[Embodiment of the Invention] Drawing 1 shows the cross-section structure of the glass cutter 1 which showed the 1st operation gestalt of this invention. The glass cutter 1 mainly consists of body section 1a which consists of a barrel 2, and cutter-head section 1b which attached in the attaching part 4 the wheel 3 which consists of a tungsten alloy free [a revolution]. Cutter-head section 1b can slide in the vertical direction by inserting the shaft 6 prepared in the attaching part 4 in the axial supporter 7 attached in the soffit of a barrel 2. This shaft 6 has the rivet-like head 8 in that upper bed so that it may not fall out from said axial supporter 7.

[0019] moreover, in this invention, it mentions later -- as -- the time of a scribe -- cutter-head section 1b -- a shaft 6 -- above -- specified quantity push **** -- since it has the composition of giving impulse force to cutter-head section 1b, by things, the shaft 6 has structure which has the stroke of the specified quantity in shaft orientations.

[0020] Flanged-end-like stop section 2a is formed in the hollow circles of the barrel 2 used as the

grasping section so that the centrum may be carried out up and down for 2 minutes. As shown in the expanded sectional view seen upward with the A-A' line of drawing 1, the circular aperture 10 is formed in the location [core] shifted at the stop section 2a. This stop section 2a is actually formed in one with a barrel 2.

[0021] A push rod 11 is dedicated in contact with the head 8 of said shaft 6, and in order to make the Shimonaka hollow part of stop section 2a generate impulse force, the coil spring 13 for making the hammer section 12 and the hammer section 12 which have predetermined weight energize downward is dedicated to the Kaminaka hollow part of stop section 2a by it. In the crowning 14 of body section 1a, the soffit of screw ** rare ***** and this screw 15 is suppressing [the screw 15] the upper bed of a coil spring 13. Therefore, the energization force of a coil spring 13 can be adjusted by turning this screw 15 and moving it up and down.

[0022] Said push rod 11 is located in a loosely-fitting condition in the hollow department by making the outer diameter smaller about several mm than the bore of the centrum of the barrel 2 lower part. And a cone 16 is formed in the upper bed section of a push rod 11, and the thin pillar-shaped object 17 is further formed in the point of the cone 16 at it. The outer diameter in the pars basilaris ossis occipitalis in said cone 16 is smaller than the outer diameter of a push rod 11, and, thereby, the coil spring 18 of a truncated-cone configuration is formed between the shoulder produced on the push-rod 11 top face, and stop section 2a. While energizing a push rod 11 caudad, said pillar-shaped object 17 is made to agree in the medial axis of a centrum with this coil spring 18 at the time of standby.

[0023] The hole 19 which goes to the location [core / the] (the direction of drawing Nakamigi) shifted up is formed in the underside of the above-mentioned hammer section 12. The path of this hole 19 has oversized from the path of the pillar-shaped object 17 of a push rod 11 somewhat. In the expanded sectional view in an A-A' line, the aperture 10 of stop section 2a is located so that the pillar-shaped object 17 of said hole 19 and a push rod 11 may be included.

[0024] Moreover, as shown in the expanded sectional view in a B-B' line at the hammer section 12, slot 12a of a couple is formed in shaft orientations, and projection 2b is formed in the inner skin of a barrel 2 at shaft orientations so that it may engage with those slot 12a. Thereby, as for the hammer section 12, a revolution of a hoop direction is regulated in the case of vertical movement. In addition, as long as an equivalent function is obtained as a substitute of coil springs 13 and 18, you may be other elastic bodies.

[0025] Actuation of this cutter 1 described above is explained according to the important section expanded sectional view of drawing 2. (a) Drawing is in the same condition as drawing 1 in the case at the time of standby. Next, if grasped body section 1a is forced caudad and a wheel 3 is forced on a glass plate, the energization force of a coil spring 13 will be resisted and a push rod 11 will go up. If the front face of the cone 16 of the push rod 11 comes to run against stop section 2a, as shown in (b) drawing, while push-rod 11 the very thing changes the sense clockwise, it will go up after that.

[0026] (c) As drawing shown the place where the pillar-shaped object 17 located in the crowning of that cone 16 agreed in the hole 19 formed in the underside of the hammer section 12 and it shown in it in (d) drawing after this, the hammer section 12 descends in an instant, and the field Z of that hole 19 collides with the upper bed side of the pillar-shaped object 17. The down impulse force generated at this time gets across to the wheel 3 of cutter-head section 1b through a push rod 11 and a shaft 6.

[0027] Thus, after forcing cutter-head section 1b on a glass plate and checking generating of this impulse force until impulse force occurs, a scribe is performed like the usual case. it required for generating of this impulse force -- it pushes and ** is needed by the scribe start point -- the optimal, if it cuts deeply and considers as ** at a scribe start point -- it cuts deeply and ** can be impressed.

[0028] Moreover, since impulse force is given through a wheel 3 to a glass plate in the condition of cutting deeply and applying **, growth of a vertical crack is promoted further and a deep vertical crack is obtained.

[0029] Drawing 3 showed typically the vertical crack formed by this glass cutter 1. The vertical crack C effective in a glass plate 101 is formed from the scribe start point. On the other hand, as the vertical crack C formed by the conventional glass cutter 100 is shown in drawing 4, it turns out that the empty end part V exists in early stages of a scribe start point.

[0030] drawing 1 -- glass -- a cutter -- one -- **** -- a trigger mechanism -- ***** -- a push rod -- 11 -- a head -- pillar-shaped -- the body -- 17 -- a hammer -- the section -- 12 -- a hole -- 19

-- fitting in -- being crowded -- a configuration -- ** -- having carried out -- although -- drawing 5 -- having been shown -- being another -- a trigger mechanism -- **** -- a hammer -- the section -- 12 -- ' -- two -- a step -- a configuration -- a hole -- 19 -- ' -- having formed -- things -- restoration of a coil spring 13 -- 2 times -- another ** and impulse force -- 2 times -- it can generate .

[0031] The sectional view of one example of cutter-head section 1b was shown in drawing 6 . The cotton wick 25 is inserted in the interior of a shaft 6, and impregnation of the cutter oil is carried out to this cotton wick 25. The head of a cotton wick 25 touches the wheel 3, and can supply a cutter oil now.

[0032] Drawing 7 shows glass cutter 1' which showed the 2nd operation gestalt of this invention. Although slot 12a was formed in the inner skin of a barrel 2 in the thing of drawing 1 at the periphery of projection 2a and the hammer section 12 in order to regulate a revolution of the hoop direction of the hammer section 12, processing detailed for that purpose is needed.

[0033] So, in glass cutter 1' of drawing 7 , it changes to said hole 19 and the ring-like slot 26 is formed in the underside of hammer section 12'. Thereby, even if hammer section 12' is rotating to the hoop direction, when stop section 2a contacts the ramp 21 and a push rod 20 inclines clockwise, the pillar-shaped object 22 of that surely gets into a slot 26.

[0034] Moreover, in this glass cutter 1', since head 8' of a shaft 6 is made into a flat surface, the pars basilaris ossis occipitalis 23 of a push rod 20 is made into the shape of a bowl at reverse and it was made to become independent at the time of standby, the coil spring 18 adopted by drawing 1 is made unnecessary.

[0035] Drawing 8 shows the cross-section structure of the glass cutter 31 which showed the 3rd operation gestalt of this invention, and attaches the common sign about drawing 1 and a corresponding element. A stopper 32 is attached in the shaft 6 which extends more nearly up than the attaching part 4 of cutter-head section 31b fixed on the way, the further iron bobbin 33 is inserted in it free [sliding], and the upper bed of this shaft 6 is thrust into the underside of a magnet 34.

[0036] A stopper's 32 underside contacted 1st shoulder 7a of the axial supporter 7, and the underside of a bobbin 33 is in contact with 2nd shoulder 7b of the axial supporter 7. Moreover, the underside of a magnet 34 is in contact with stop section 2a of the shape of a flange formed in the inner skin of a barrel 2. And the coil spring 35 is inserted in between the undersides of lobe 33a of the direction of a path formed in the soffit section of a bobbin 33, and said stop section 2a. Moreover, the upper limit stopper 36 is for regulating above migration of a magnet 34.

[0037] At the time of the standby shown by drawing 8 , when the bobbin 33 is energized downward with the coil spring 35 and is sticking to a magnet 34 in one, a shaft 6 and cutter-head section 31b are also energized downward.

[0038] Next, if a wheel 3 is forced on a glass plate as shown in (a) drawing of drawing 9 , a magnet 34 and a bobbin 33 will be united, it will move up, and a coil spring 35 will be compressed by migration of this bobbin 33. Consequently, the downward force (that is, force which pulls apart a bobbin 33 from a magnet 34) acts on a bobbin 33 by the reaction of this coil spring 35.

[0039] If said wheel 3 is further forced on the glass plate, the repulsive force of a coil spring 35 will increase in proportion to the movement magnitude of a magnet 34. If the repulsive force exceeds the suction force between a magnet 34 and a bobbin 33, as shown in (b) drawing, only a bobbin 33 will descend according to the energization force of a coil spring 35 in an instant, and will hit a stopper 32 on a top face. Thereby, downward impulse force joins the wheel 3 of cutter-head section 31b through a shaft 6, and the same operation effectiveness as a front operation gestalt is acquired.

[0040] A magnet 34 and a bobbin 33 are separable in the amount of pushing of a request of cutter-head section 31b by [which change the die length of the path of a magnet 34, or changes a magnetic material] melting, changing magnetism, changing the spring multiplier of a coil spring 35, or changing die length. Moreover, what is necessary is to change the mass of a bobbin 33 into changing impulse force, or just to change the distance of a bobbin 33 and a stopper 32. In addition, the timing of separation of a magnet 34 of an electromagnet, then a bobbin 33 can be set up optionally. Moreover, you may make it separate a bobbin 33 by energization OFF to an electromagnet.

[0041] Drawing 10 shows the cross-section structure of the glass cutter 41 which showed the 4th operation gestalt of this invention. Differing from drawing 8 makes upper limit stopper 36' pipe structure, and he is trying to lead EA to the upper part of a barrel 2 through the upper limit stopper 36. Thereby, a magnet 34 acts as a piston and desired scribe ** can be set as a wheel 3 by adjusting air pressure.

[0042] Drawing 11 shows the cross-section structure of the glass cutter 51 which showed the 5th operation gestalt of this invention. Differing from drawing 8 is suppressing the upper bed of a coil spring 35 by the barrel member 37 which made the cop the upside-down. The magnet 34 makes that path small so that this barrel member 37 may not be contacted, and the barrel member 37 is formed with a nonferrous material so that a magnet 34 may not be adsorbed. And it turns to the upper part of the barrel member 37, and the screw 38 is attached, by [the] turning and turning a screw 38, the barrel member 37 fluctuates and spacing of a coil spring 35 can be changed now. By this configuration, the separation timing of a bobbin 33 can be set up optionally.

[0043] the 3- described above -- with the 5th operation gestalt, although it was the configuration that a bobbin 33 was separated according to the holding power of a magnet 34, the separation point may be uniformly held neither with secular change of a coil spring 35, nor the dirt of the adsorption side of a magnet 34. In order to solve this problem, drawing 12 shows the glass cutter 61 of the 6th operation gestalt of this invention.

[0044] To the upper part of a bobbin 33, the path is made small and this forms shoulder 33b in a bobbin 33. and longer in the wire extension of stop section 2a' than stop section 2a of drawing 8 -- it is seeing. By this, although a magnet 34 and a bobbin 33 are united and go up by pushing of cutter-head section 31b If said stop section 2a' contacts said shoulder 33b, lifting of a bobbin 33 will be restrained after this. As a result of the migration of a magnet 34, a bobbin 33 is separated from a magnet 34 and the underside of a bobbin 33 hits a stopper 32 on a top face like the glass cutter 31 of drawing 8 after that.

[0045] Drawing 13 shows the cross-section structure of the glass cutter 61 which showed the 7th operation gestalt of this invention. The iron ring member 43 is fixed to stop section 2a of a barrel 2, and the disc-like magnet 44 located in the upper part is fixed with a shaft 6. And the coil spring which suited drawing 8 is excluded.

[0046] (A) Drawing shows the condition at the time of standby, and the magnet 44 is sticking to the ring member 43. If a barrel 2 is caudad pushed in in this condition, adsorption with a magnet 44 and the ring member 43 will be canceled, only a barrel 2 will descend below, and the underside of stop section 2a of a barrel 2 will collide with a stopper's 32 top face currently fixed to the shaft 6. Thereby, Shimomukai's impulse force is added to a wheel 3. In addition, the ring member 43 is used as a magnet, and it is good also considering 44 as an iron ingredient, or good also considering both sides as a magnet.

[0047] Although not illustrated inside the cylinder part 2 of the crow cutter of the 1st to 6th operation gestalt of this invention, while stopping the migration to the upper part of a shaft 6, the device which makes cutter-head section 1b pivotable is built in, and ** omits for details here.

[0048] 31, 51, 61, and 71 can also be used being able to equip the glass cutter 1 described above, 1', and equipment as shown below, although all grasp the body section by hand and carry out a scribe.

[0049] Drawing 14 shows the circular 90 which keeps winding a glass plate 101 circularly. A sucker 72 is fixed on a glass plate 101, and the sucker 72 is formed in an arm 73 pivotable as a core, and it is movable in the direction of an arrow head by using the sucker 72 section as the supporting point. The cutter-head holder 74 is attached in the edge of the arm 73 free [migration in the direction of an arm]. Body section 1a of the cutter head 110 of this invention is attached in the cutter-head holder 74. And it is equipped with the grip section 75 to the upper part of the cutter head 110.

[0050] Since a trigger generating means will act and an impact will join a wheel 3 as mentioned already if the grip section 75 is forced on a grip and down by hand, after that, circle migration of the grip section 75 is carried out, and the scribe of the glass plate 101 is carried out.

[0051] Drawing 15 shows the **** end 91 which keeps winding a glass plate 101 circularly. Standing ways 83 are established in the edge of a table 82, and the fixed arm 84 which extends in the direction of a core of a table 82 from the upper bed section of the support column of these standing ways 83 is attached. The bearing 85 of the vertical direction is attached in the point of the fixed arm 84, and the cutter-head holder 74 which fixed the cutter head 110 to the point of the revolving arm 87 which extends horizontally is attached in it from the soffit section of the revolving shaft 86 inserted in the bearing 85. Moreover, the arm 88 for a preparation is attached in the upper bed of said revolving shaft 86.

[0052] Also in this case, the arm 88 for a preparation is forced downward, and after making the wheel of a cutter head 110 generate an impact, the scribe of the arm 88 for that preparation is turned and carried out.

[0053] Drawing 16 shows the variant end cutting machine 92 which keeps winding a glass plate 101 with a free closed contour. By making an arm 92 into a joint device, the cutter head 110 attached at the head of an arm can be moved to an optional location.

[0054] In each above finishing machine, 1, 1', and which glass cutter of 31, 51, and 61 may be used for a cutter head 110.

[0055] With a rotary table 112, the cutter head 120 which is movable in the direction (direction vertical to the inside of drawing 16 and space) of Y, and, on the other hand, possesses the cutter 41 for brittle material cutting of the invention in this application in a soffit with a ball screw 113 makes movable the table 111 which drawing 17 shows the front view of the common automatic glass scribe 93, and lays a glass plate 101 in the direction of X (the inside of drawing 16, longitudinal direction) along with a rail 114 while it rotates horizontally. If a scribe is similarly carried out after carrying out the scribe of the glass plate 101 in the direction of X by moving a cutter head 120 in the direction of X and rotating 90 degrees of tables 111 after this whenever it moves a table 111 in the direction of Y in a predetermined pitch at the time of a scribe, the scribe of the glass plate 101 will be shortly carried out in the direction of Y.

[0056] The automatic glass scribe shown here is an example, and a cutter head 120 is fixed and it can apply the cutter for brittle material cutting of the invention in this application also to the type which a table 111 moves in the direction of X, and the direction of Y, and the type which a table 111 is fixed and a cutter head 120 moves in X and the direction of Y.

[0057] Drawing 18 shows the automatic circular scribe 94 which keeps winding a glass plate 101 circularly, a stanchion 132 is formed in the edge of a table 131, and the fixed arm 133 which extends in the direction of a core of a table 131 from the upper bed section of this stanchion is attached. The bearing 134 of the vertical direction is attached in the point of the fixed arm 133, and the cutter head 140 which possesses the cutter 41 for brittle material cutting of the invention in this application in the point of the revolving arm 136 which extends horizontally is attached in it from the soffit section of the revolving shaft 135 inserted in the bearing 134. Moreover, the motor 137 is connected to the upper bed of said revolving shaft 135. At the time of a scribe, a revolving shaft 135, a revolving arm 136, and a motor 137 are united, and a cutter head 140 also descends by descending toward a glass plate 101. And when a cutter head rotates one time by the motor 137, the scribe of the glass plate 101 is carried out circularly.

[0058]

[Effect of the Invention] By the brittle material cutting cutter of this invention, by a trigger means' operating the cutter-head section, when it is specified quantity push ****, and impressing impulse force to the edge of a blade of the cutter-head section by the actuation, the vertical crack more effective in a brittle material than the time of scribe initiation was formed, and the phenomenon called the empty end was able to be abolished.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the cutter used in order to cut especially glass about the cutter used in order to cut a brittle material.

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PRIOR ART

[Description of the Prior Art] First, the case of glass is explained to an example about cutting of a brittle material. As an approach of cutting glass, the following are used widely. that is, it is the diamond cutter which has the chip of a diamond, and a wheel cutter made from cemented carbide, a glass front face is lengthened and scratched (it is called a scribe), a crack is generated near a glass front face, and the bending moment, impulse force, etc. are acted along with the crack -- making -- the interior of glass -- it is the approach of growing up a crack deeply and dividing.

[0003] For example, the glass cutter 100 with a wheel shows the situation when generating a crack to a glass plate 101 at drawing 19 . If a forcing pressure exceeds the critical value of the stress-strain diagram of glass when the wheel 3 made from cemented carbide is forced on a glass front face, a crack 102 will arise perpendicularly in the plate surface which is the pressure direction. This is called vertical crack. If this vertical crack grows, it grows up to the opposite hand of a glass plate and it reaches, a glass plate 101 will be divided.

[0004] When a forcing pressure is large, also horizontally, the crack 103 of the shape of a character of 8 arises. This is called level crack. If a level crack occurs, when it extends, a forcing pressure will be offset and expansion of a vertical crack important for fragmentation will be checked. Moreover, surface glass will separate and cut and will become powder.

[0005] Therefore, when carrying out the scribe of the glass front face by the glass cutter, it is important to make it a level crack not occur.

[0006] As a factor which affects this scribe, there is the following typically.

(1) Cutter : it is ((the diameter of a wheel: in the case of a wheel cutter) 2) whenever [class, construction material, and tool angle]. Glass: The property near a front face, a glass presentation, and residual stress (3) Scribe conditions: An edge-of-a-blade load and scribe rate (4) Environment: Existence of the temperature of an ambient atmosphere, humidity, and a cutter oil [0007] In order to divide a thick glass plate to accuracy, it is necessary to obtain a deep vertical crack. For that, it is good to enlarge whenever [tool angle] and to enlarge an edge-of-a-blade load. Moreover, in the case of a wheel cutter, it is also effective to enlarge the diameter of a wheel.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] By the brittle material cutting cutter of this invention, by a trigger means' operating the cutter-head section, when it is specified quantity push ****, and impressing impulse force to the edge of a blade of the cutter-head section by the actuation, the vertical crack more effective in a brittle material than the time of scribe initiation was formed, and the phenomenon called the empty end was able to be abolished.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Now, in case it has a glass cutter by hand and the scribe of the glass front face is carried out, it is common for the time of scribe initiation not to be enough as the load applied to the edge of a blade. For this reason, that an effective vertical crack cannot be obtained often arises. A scribe part without generating of this effective vertical crack will be called an "empty end part" on these descriptions. At the time of this empty end, the Chile Chile sound peculiar to a scribe accompanying vertical crack initiation is not generated.

[0009] When the effective vertical crack was not obtained by the scribe start point, for example bending stress was given and divided to a glass plate, this part that beginning cuts could not divide to accuracy, but there was nonconformity that the fragmentation remaining part of the glass called an angle (**) occurred. It was difficult to obtain an effective vertical crack from a scribe start point to the ultra-thin glass plate used [especially] for a liquid crystal display panel etc.

[0010] This invention aims at offering the cutter for brittle material * which can generate an effective vertical crack from a scribe start point by the easy device. Moreover, also let it be the object to offer the approach of generating and carrying out the scribe of the effective vertical crack from the time of the scriber using the cutter, and scribe initiation.

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MEANS

[Means for Solving the Problem] In the cutter possessing the cylinder part (2) which contains the support shaft (6) with which the cutter for brittle cutting of this invention supports the cutting edge for brittle material cutting (3), and said cutting edge, and said support shaft, said cylinder part is characterized by to hold said support shaft possible [sliding of order] and said cylinder part possessing a trigger generating means and an impact impression means in the interior.

[0012] And said trigger generating means consists of an elastic body (13), a weight body (12) which has a crevice, and a cone configuration object (16). It operates by getting into said crevice where said support shaft carried out specified quantity migration within said cylinder part, and said some of cone configuration objects were prepared in said weight body, in case said cylinder part is grasped at the time of cutting initiation and said cutting edge is forced on a cut member, In case said impact impression means consists of said weight body and said trigger generating means operates, it is characterized by transmitting an impact to said cutting edge through said support shaft because said weight body returns to an initial position according to an operation of said elastic body in an instant.

[0013] Moreover, said trigger generating means consists of an elastic body (35) which controls migration of the 1st attraction member (33), the 2nd attraction member (34), and the 1st attraction member. In order to force said cutting edge on a cut member at the time of cutting initiation, when grasping said cylinder part, sliding said support shaft and said 1st attraction member separates from the 2nd attraction member in an instant In case operating and said impact impression means consist of a stop means (32) and said trigger generating means operates, it is characterized by transmitting an impact to said cutting edge through said support shaft because said 1st attraction member returns to an initial position according to an operation of said elastic body in an instant.

[0014] Further, The Ayr installation means is established in said cylinder part, a piston function is given to said 2nd attraction member (34), and it is characterized by setting predetermined scribe ** as adjustable with air pressure.

[0015] The above-mentioned trigger generating means uses whether they are that some cone configuration objects (16) get into the crevice of a weight body (12), that the 1st attraction member (33) and the 2nd attraction means (34) separate in an instant, that the 1st attraction member (43) and the 2nd attraction member separate in an instant, and *****,

[0016] The above-mentioned impact seal-of-approval means uses whether they are that a weight body (12) or the 1st attraction member (33) returns to initial value according to an operation of an elastic body in an instant, that the 1st stop member (32) makes it collide with the 1st attraction member (43), and *****,

[0017] Although a coil spring, a compression spring, etc. are mainly used as an elastic body, you may be the rubber material and resin of a low degree of hardness.

[0018]

[Embodiment of the Invention] Drawing 1 shows the cross-section structure of the glass cutter 1 which showed the 1st operation gestalt of this invention. The glass cutter 1 mainly consists of body section 1a which consists of a barrel 2, and cutter-head section 1b which attached in the attaching part 4 the wheel 3 which consists of a tungsten alloy free [a revolution]. Cutter-head section 1b can slide in the vertical direction by inserting the shaft 6 prepared in the attaching part 4 in the axial supporter 7 attached in the soffit of a barrel 2. This shaft 6 has the rivet-like head 8 in that upper bed so that it may

not fall out from said axial supporter 7.

[0019] moreover, in this invention, it mentions later -- as -- the time of a scribe -- cutter-head section 1b -- a shaft 6 -- above -- specified quantity push **** -- since it has the composition of giving impulse force to cutter-head section 1b, by things, the shaft 6 has structure which has the stroke of the specified quantity in shaft orientations.

[0020] Flanged-end-like stop section 2a is formed in the hollow circles of the barrel 2 used as the grasping section so that the centrum may be carried out up and down for 2 minutes. As shown in the expanded sectional view seen upward with the A-A' line of drawing 1, the circular aperture 10 is formed in the location [core] shifted at the stop section 2a. This stop section 2a is actually formed in one with a barrel 2.

[0021] A push rod 11 is dedicated in contact with the head 8 of said shaft 6, and in order to make the Shimonaka hollow part of stop section 2a generate impulse force, the coil spring 13 for making the hammer section 12 and the hammer section 12 which have predetermined weight energize downward is dedicated to the Kaminaka hollow part of stop section 2a by it. In the crowning 14 of body section 1a, the soffit of screw ** rare ***** and this screw 15 is suppressing [the screw 15] the upper bed of a coil spring 13. Therefore, the energization force of a coil spring 13 can be adjusted by turning this screw 15 and moving it up and down.

[0022] Said push rod 11 is located in a loosely-fitting condition in the hollow department by making the outer diameter smaller about several mm than the bore of the centrum of the barrel 2 lower part. And a cone 16 is formed in the upper bed section of a push rod 11, and the thin pillar-shaped object 17 is further formed in the point of the cone 16 at it. The outer diameter in the pars basilaris ossis occipitalis in said cone 16 is smaller than the outer diameter of a push rod 11, and, thereby, the coil spring 18 of a truncated-cone configuration is formed between the shoulder produced on the push-rod 11 top face, and stop section 2a. While energizing a push rod 11 caudad, said pillar-shaped object 17 is made to agree in the medial axis of a centrum with this coil spring 18 at the time of standby.

[0023] The hole 19 which goes to the location [core / the] (the direction of drawing Nakamigi) shifted up is formed in the underside of the above-mentioned hammer section 12. The path of this hole 19 has oversized from the path of the pillar-shaped object 17 of a push rod 11 somewhat. In the expanded sectional view in an A-A' line, the aperture 10 of stop section 2a is located so that the pillar-shaped object 17 of said hole 19 and a push rod 11 may be included.

[0024] Moreover, as shown in the expanded sectional view in a B-B' line at the hammer section 12, slot 12a of a couple is formed in shaft orientations, and projection 2b is formed in the inner skin of a barrel 2 at shaft orientations so that it may engage with those slot 12a. Thereby, as for the hammer section 12, a revolution of a hoop direction is regulated in the case of vertical movement. In addition, as long as an equivalent function is obtained as a substitute of coil springs 13 and 18, you may be other elastic bodies.

[0025] Actuation of this cutter 1 described above is explained according to the important section expanded sectional view of drawing 2. (a) Drawing is in the same condition as drawing 1 in the case at the time of standby. Next, if grasped body section 1a is forced caudad and a wheel 3 is forced on a glass plate, the energization force of a coil spring 13 will be resisted and a push rod 11 will go up. If the front face of the cone 16 of the push rod 11 comes to run against stop section 2a, as shown in (b) drawing, while push-rod 11 the very thing changes the sense clockwise, it will go up after that.

[0026] (c) As drawing shown the place where the pillar-shaped object 17 located in the crowning of that cone 16 agreed in the hole 19 formed in the underside of the hammer section 12 and it shown in it in (d) drawing after this, the hammer section 12 descends in an instant, and the field Z of that hole 19 collides with the upper bed side of the pillar-shaped object 17. The down impulse force generated at this time gets across to the wheel 3 of cutter-head section 1b through a push rod 11 and a shaft 6.

[0027] Thus, after forcing cutter-head section 1b on a glass plate and checking generating of this impulse force until impulse force occurs, a scribe is performed like the usual case. it required for generating of this impulse force -- it pushes and ** is needed by the scribe start point -- the optimal, if it cuts deeply and considers as ** at a scribe start point -- it cuts deeply and ** can be impressed.

[0028] Moreover, since impulse force is given through a wheel 3 to a glass plate in the condition of cutting deeply and applying **, growth of a vertical crack is promoted further and a deep vertical crack is obtained.

[0029] Drawing 3 showed typically the vertical crack formed by this glass cutter 1. The vertical crack C effective in a glass plate 101 is formed from the scribe start point. On the other hand, as the vertical crack C formed by the conventional glass cutter 100 is shown in drawing 4, it turns out that the empty end part V exists in early stages of a scribe start point.

[0030] drawing 1 -- glass -- a cutter -- one -- **** -- a trigger mechanism -- ***** -- a push rod -- 11 -- a head -- pillar-shaped -- the body -- 17 -- a hammer -- the section -- 12 -- a hole -- 19 -- fitting in -- being crowded -- a configuration -- ** -- having carried out -- although -- drawing 5 -- having been shown -- being another -- a trigger mechanism -- **** -- a hammer -- the section -- 12 -- ' -- two -- a step -- a configuration -- a hole -- 19 -- ' -- having formed -- things -- restoration of a coil spring 13 -- 2 times -- another ** and impulse force -- 2 times -- it can generate .

[0031] The sectional view of one example of cutter-head section 1b was shown in drawing 6. The cotton wick 25 is inserted in the interior of a shaft 6, and impregnation of the cutter oil is carried out to this cotton wick 25. The head of a cotton wick 25 touches the wheel 3, and can supply a cutter oil now.

[0032] Drawing 7 shows glass cutter 1' which showed the 2nd operation gestalt of this invention. Although slot 12a was formed in the inner skin of a barrel 2 in the thing of drawing 1 at the periphery of projection 2a and the hammer section 12 in order to regulate a revolution of the hoop direction of the hammer section 12, processing detailed for that purpose is needed.

[0033] So, in glass cutter 1' of drawing 7, it changes to said hole 19 and the ring-like slot 26 is formed in the underside of hammer section 12'. Thereby, even if hammer section 12' is rotating to the hoop direction, when stop section 2a contacts the ramp 21 and a push rod 20 inclines clockwise, the pillar-shaped object 22 of that surely gets into a slot 26.

[0034] Moreover, in this glass cutter 1', since head 8' of a shaft 6 is made into a flat surface, the pars basilaris ossis occipitalis 23 of a push rod 20 is made into the shape of a bowl at reverse and it was made to become independent at the time of standby, the coil spring 18 adopted by drawing 1 is made unnecessary.

[0035] Drawing 8 shows the cross-section structure of the glass cutter 31 which showed the 3rd operation gestalt of this invention, and attaches the common sign about drawing 1 and a corresponding element. A stopper 32 is attached in the shaft 6 which extends more nearly up than the attaching part 4 of cutter-head section 31b fixed on the way, the further iron bobbin 33 is inserted in it free [sliding], and the upper bed of this shaft 6 is thrust into the underside of a magnet 34.

[0036] A stopper's 32 underside contacted 1st shoulder 7a of the axial supporter 7, and the underside of a bobbin 33 is in contact with 2nd shoulder 7b of the axial supporter 7. Moreover, the underside of a magnet 34 is in contact with stop section 2a of the shape of a flange formed in the inner skin of a barrel 2. And the coil spring 35 is inserted in between the undersides of lobe 33a of the direction of a path formed in the soffit section of a bobbin 33, and said stop section 2a. Moreover, the upper limit stopper 36 is for regulating above migration of a magnet 34.

[0037] At the time of the standby shown by drawing 8, when the bobbin 33 is energized downward with the coil spring 35 and is sticking to a magnet 34 in one, a shaft 6 and cutter-head section 31b are also energized downward.

[0038] Next, if a wheel 3 is forced on a glass plate as shown in (a) drawing of drawing 9, a magnet 34 and a bobbin 33 will be united, it will move up, and a coil spring 35 will be compressed by migration of this bobbin 33. Consequently, the downward force (that is, force which pulls apart a bobbin 33 from a magnet 34) acts on a bobbin 33 by the reaction of this coil spring 35.

[0039] If said wheel 3 is further forced on the glass plate, the repulsive force of a coil spring 35 will increase in proportion to the movement magnitude of a magnet 34. If the repulsive force exceeds the suction force between a magnet 34 and a bobbin 33, as shown in (b) drawing, only a bobbin 33 will descend according to the energization force of a coil spring 35 in an instant, and will hit a stopper 32 on a top face. Thereby, downward impulse force joins the wheel 3 of cutter-head section 31b through a shaft 6, and the same operation effectiveness as a front operation gestalt is acquired.

[0040] A magnet 34 and a bobbin 33 are separable in the amount of pushing of a request of cutter-head section 31b by [which change the die length of the path of a magnet 34, or changes a magnetic material] melting, changing magnetism, changing the spring multiplier of a coil spring 35, or changing die length. Moreover, what is necessary is to change the mass of a bobbin 33 into changing impulse force, or just to change the distance of a bobbin 33 and a stopper 32. In addition, the timing of separation of a magnet 34

of an electromagnet, then a bobbin 33 can be set up optionally. Moreover, you may make it separate a bobbin 33 by energization OFF to an electromagnet.

[0041] Drawing 10 shows the cross-section structure of the glass cutter 41 which showed the 4th operation gestalt of this invention. Differing from drawing 8 makes upper limit stopper 36' pipe structure, and he is trying to lead EA to the upper part of a barrel 2 through the upper limit stopper 36. Thereby, a magnet 34 acts as a piston and desired scribe ** can be set as a wheel 3 by adjusting air pressure.

[0042] Drawing 11 shows the cross-section structure of the glass cutter 51 which showed the 5th operation gestalt of this invention. Differing from drawing 8 is suppressing the upper bed of a coil spring 35 by the barrel member 37 which made the cop the upside-down. The magnet 34 makes that path small so that this barrel member 37 may not be contacted, and the barrel member 37 is formed with a nonferrous material so that a magnet 34 may not be adsorbed. And it turns to the upper part of the barrel member 37, and the screw 38 is attached, by [the] turning and turning a screw 38, the barrel member 37 fluctuates and spacing of a coil spring 35 can be changed now. By this configuration, the separation timing of a bobbin 33 can be set up optionally.

[0043] the 3- described above — with the 5th operation gestalt, although it was the configuration that a bobbin 33 was separated according to the holding power of a magnet 34, the separation point may be uniformly held neither with secular change of a coil spring 35, nor the dirt of the adsorption side of a magnet 34. In order to solve this problem, drawing 12 shows the glass cutter 61 of the 6th operation gestalt of this invention.

[0044] To the upper part of a bobbin 33, the path is made small and this forms shoulder 33b in a bobbin 33. and longer in the wire extension of stop section 2a' than stop section 2a of drawing 8 — it is seeing. By this, although a magnet 34 and a bobbin 33 are united and go up by pushing of cutter-head section 31b If said stop section 2a' contacts said shoulder 33b, lifting of a bobbin 33 will be restrained after this. As a result of the migration of a magnet 34, a bobbin 33 is separated from a magnet 34 and the underside of a bobbin 33 hits a stopper 32 on a top face like the glass cutter 31 of drawing 8 after that.

[0045] Drawing 13 shows the cross-section structure of the glass cutter 61 which showed the 7th operation gestalt of this invention. The iron ring member 43 is fixed to stop section 2a of a barrel 2, and the disc-like magnet 44 located in the upper part is fixed with a shaft 6. And the coil spring which suited drawing 8 is excluded.

[0046] (A) Drawing shows the condition at the time of standby, and the magnet 44 is sticking to the ring member 43. If a barrel 2 is caudad pushed in in this condition, adsorption with a magnet 44 and the ring member 43 will be canceled, only a barrel 2 will descend below, and the underside of stop section 2a of a barrel 2 will collide with a stopper's 32 top face currently fixed to the shaft 6. Thereby, Shimomukai's impulse force is added to a wheel 3. In addition, the ring member 43 is used as a magnet, and it is good also considering 44 as an iron ingredient, or good also considering both sides as a magnet.

[0047] Although not illustrated inside the cylinder part 2 of the crow cutter of the 1st to 6th operation gestalt of this invention, while stopping the migration to the upper part of a shaft 6, the device which makes cutter-head section 1b pivotable is built in, and ** omits for details here.

[0048] 31, 51, 61, and 71 can also be used being able to equip the glass cutter 1 described above, 1', and equipment as shown below, although all grasp the body section by hand and carry out a scribe.

[0049] Drawing 14 shows the circular 90 which keeps winding a glass plate 101 circularly. A sucker 72 is fixed on a glass plate 101, and the sucker 72 is formed in an arm 73 pivotable as a core, and it is movable in the direction of an arrow head by using the sucker 72 section as the supporting point. The cutter-head holder 74 is attached in the edge of the arm 73 free [migration in the direction of an arm]. Body section 1a of the cutter head 110 of this invention is attached in the cutter-head holder 74. And it is equipped with the grip section 75 to the upper part of the cutter head 110.

[0050] Since a trigger generating means will act and an impact will join a wheel 3 as mentioned already if the grip section 75 is forced on a grip and down by hand, after that, circle migration of the grip section 75 is carried out, and the scribe of the glass plate 101 is carried out.

[0051] Drawing 15 shows the **** end 91 which keeps winding a glass plate 101 circularly. Standing ways 83 are established in the edge of a table 82, and the fixed arm 84 which extends in the direction of a core of a table 82 from the upper bed section of the support column of these standing ways 83 is attached. The bearing 85 of the vertical direction is attached in the point of the fixed arm 84, and the cutter-head holder 74 which fixed the cutter head 110 to the point of the revolving arm 87 which

extends horizontally is attached in it from the soffit section of the revolving shaft 86 inserted in the bearing 85. Moreover, the arm 88 for a preparation is attached in the upper bed of said revolving shaft 86.

[0052] Also in this case, the arm 88 for a preparation is forced downward, and after making the wheel of a cutter head 110 generate an impact, the scribe of the arm 88 for that preparation is turned and carried out.

[0053] Drawing 16 shows the variant end cutting machine 92 which keeps winding a glass plate 101 with a free closed contour. By making an arm 92 into a joint device, the cutter head 110 attached at the head of an arm can be moved to an optional location.

[0054] In each above finishing machine, 1, 1', and which glass cutter of 31, 51, and 61 may be used for a cutter head 110.

[0055] With a rotary table 112, the cutter head 120 which is movable in the direction (direction vertical to the inside of drawing 16 and space) of Y, and, on the other hand, possesses the cutter 41 for brittle material cutting of the invention in this application in a soffit with a ball screw 113 makes movable the table 111 which drawing 17 shows the front view of the common automatic glass scriber 93, and lays a glass plate 101 in the direction of X (the inside of drawing 16, longitudinal direction) along with a rail 114 while it rotates horizontally. If a scribe is similarly carried out after carrying out the scribe of the glass plate 101 in the direction of X by moving a cutter head 120 in the direction of X and rotating 90 degrees of tables 111 after this whenever it moves a table 111 in the direction of Y in a predetermined pitch at the time of a scribe, the scribe of the glass plate 101 will be shortly carried out in the direction of Y.

[0056] The automatic glass scriber shown here is an example, and a cutter head 120 is fixed and it can apply the cutter for brittle material cutting of the invention in this application also to the type which a table 111 moves in the direction of X, and the direction of Y, and the type which a table 111 is fixed and a cutter head 120 moves in X and the direction of Y.

[0057] Drawing 18 shows the automatic circular scriber 94 which keeps winding a glass plate 101 circularly, a stanchion 132 is formed in the edge of a table 131, and the fixed arm 133 which extends in the direction of a core of a table 131 from the upper bed section of this stanchion is attached. The bearing 134 of the vertical direction is attached in the point of the fixed arm 133, and the cutter head 140 which possesses the cutter 41 for brittle material cutting of the invention in this application in the point of the revolving arm 136 which extends horizontally is attached in it from the soffit section of the revolving shaft 135 inserted in the bearing 134. Moreover, the motor 137 is connected to the upper bed of said revolving shaft 135. At the time of a scribe, a revolving shaft 135, a revolving arm 136, and a motor 137 are united, and a cutter head 140 also descends by descending toward a glass plate 101. And when a cutter head rotates one time by the motor 137, the scribe of the glass plate 101 is carried out circularly.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] Cross-section structural drawing of the glass cutter which becomes the 1st operation gestalt of this invention

[Drawing 2] The important section expanded sectional view having shown actuation of the glass cutter of drawing 1

[Drawing 3] The sectional view of the glass plate when carrying out a scribe using the glass cutter of this invention

[Drawing 4] The sectional view of the glass plate when carrying out a scribe using the conventional glass cutter

[Drawing 5] Drawing having shown another example of the hammer section in the glass cutter of drawing 1

[Drawing 6] The detail sectional view having shown the example of a configuration of the cutter-head section in the glass cutter of drawing 1

[Drawing 7] Cross-section structural drawing of the glass cutter which becomes the 2nd operation gestalt of this invention

[Drawing 8] Cross-section structural drawing of the glass cutter which becomes the 3rd operation gestalt of this invention

[Drawing 9] Cross-section structural drawing having shown actuation of the glass cutter of drawing 8

[Drawing 10] Cross-section structural drawing of the glass cutter which becomes the 4th operation gestalt of this invention

[Drawing 11] Cross-section structural drawing of the glass cutter which becomes the 5th operation gestalt of this invention

[Drawing 12] Cross-section structural drawing of the glass cutter which becomes the 6th operation gestalt of this invention

[Drawing 13] Cross-section structural drawing of the glass cutter which becomes the 7th operation gestalt of this invention

[Drawing 14] The perspective view having shown an example of a circular

[Drawing 15] The perspective view having shown an example of the **** end

[Drawing 16] The perspective view having shown an example of the variant end

[Drawing 17] The front view of an automatic glass scriber

[Drawing 18] The front view of an automatic circular scriber

[Drawing 19] Drawing having shown the situation of the crack produced inside a glass plate at the time of a scribe

[Description of Notations]

1, 1', 31, 41, 51, 61, 71 Glass cutter

1a Body section

1b Cutter-head section

2 Barrel

2a Stop section

2b Projection

3 Wheel

4 Attaching Part
6 Shaft
7 Axial Supporter
8 Head
10 Aperture
11 Push Rod
12 Hammer Section
13 Coil Spring
14 Crowning
15 Screw
16 Cone
17 Pillar-shaped Object
18 Coil Spring
19 Hole
20 Push Rod
26 Slot
32 Stopper
33 Bobbin
34 Magnet
33a Lobe
35 Coil Spring
36 Upper Limit Stopper
37 Barrel Member
38 Turn and it is Screw.
43 Ring Member
44 Magnet

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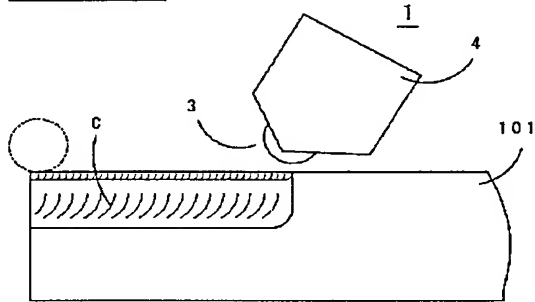
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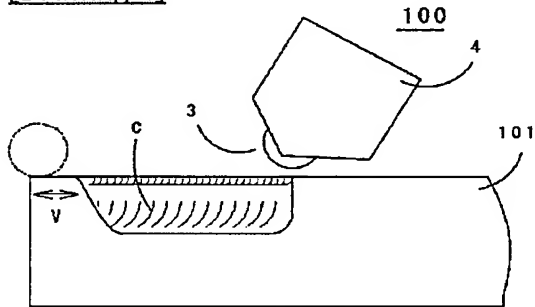
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DRAWINGS

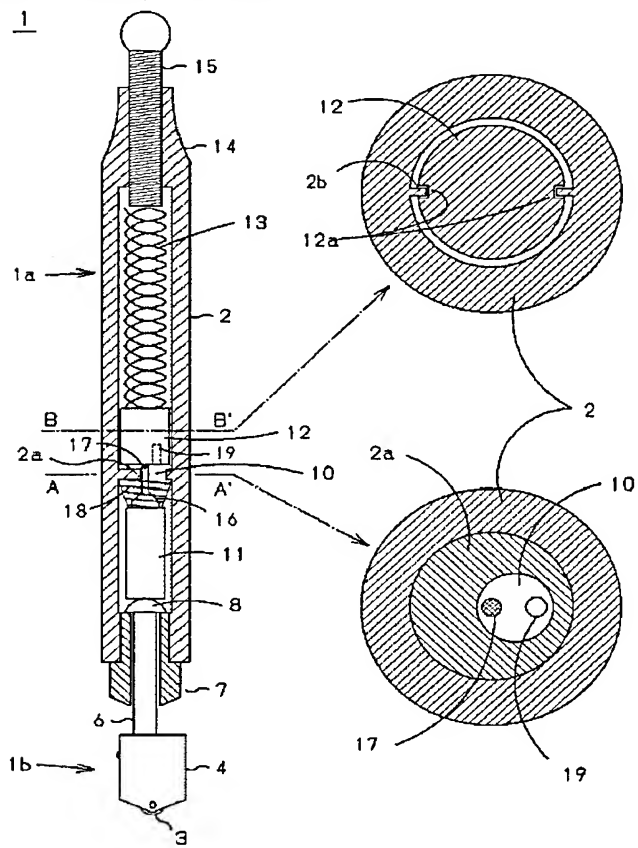
[Drawing 3]



[Drawing 4]



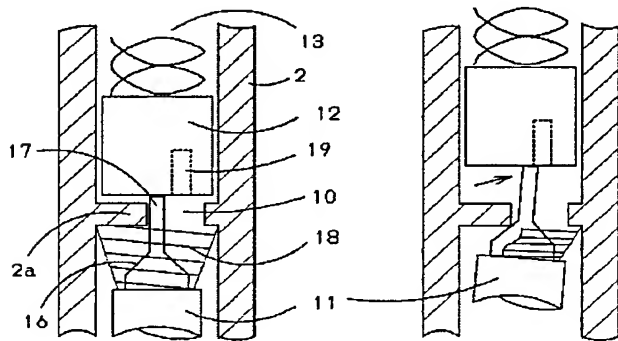
[Drawing 1]



[Drawing 2]

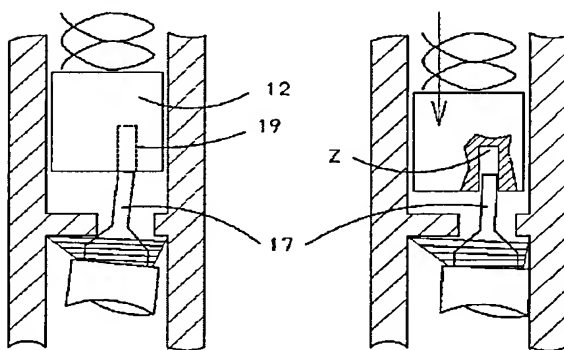
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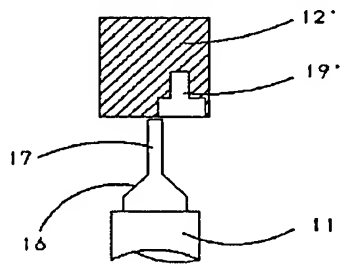
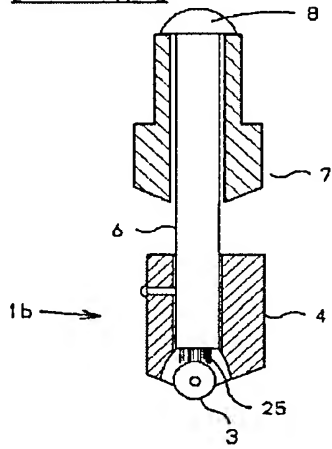
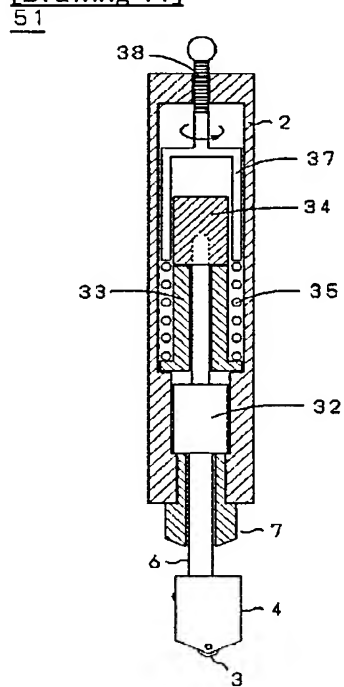


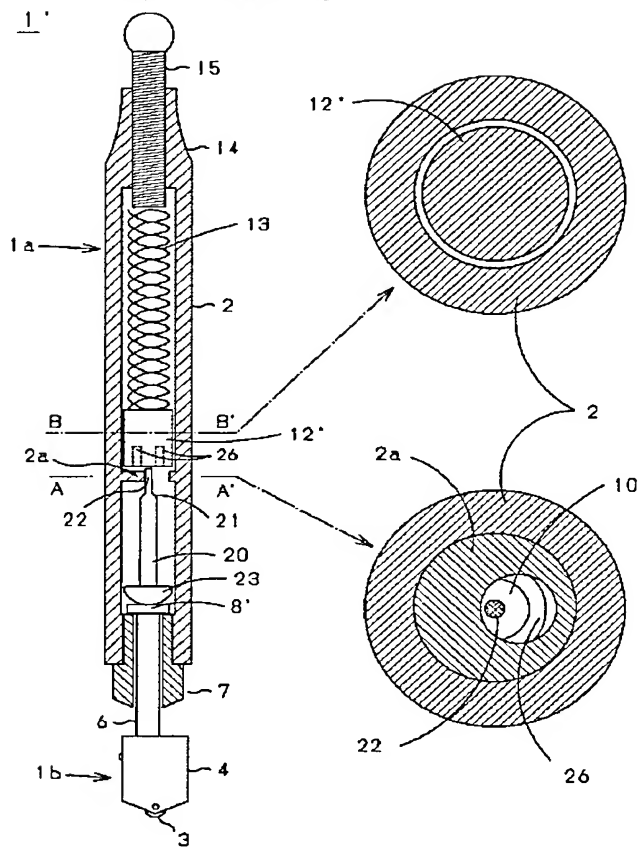
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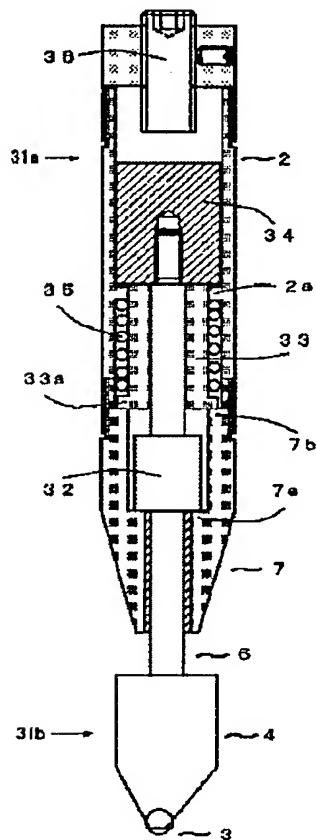


[Drawing 5]

[Drawing 6][Drawing 11][Drawing 7]

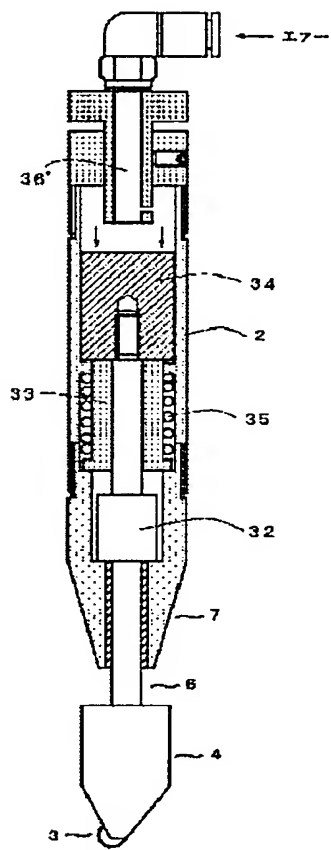


[Drawing 8]
31



[Drawing 10]

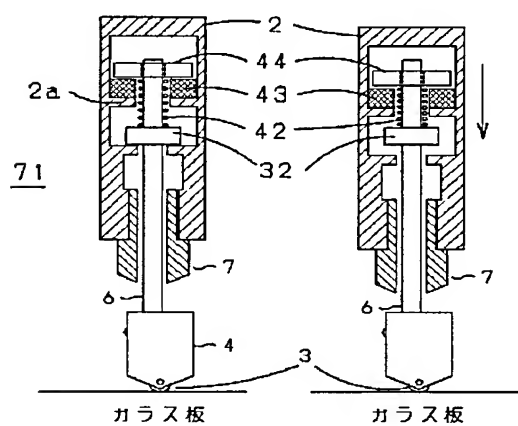
41



[Drawing 13]

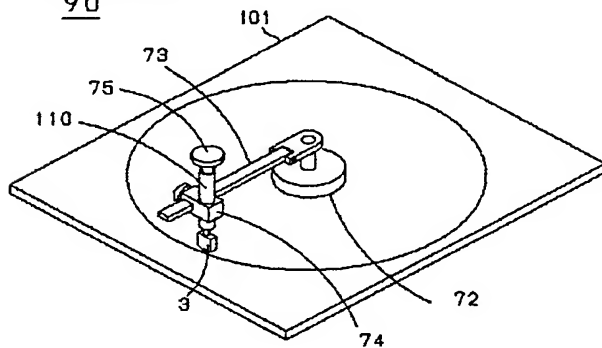
(A)

(B)

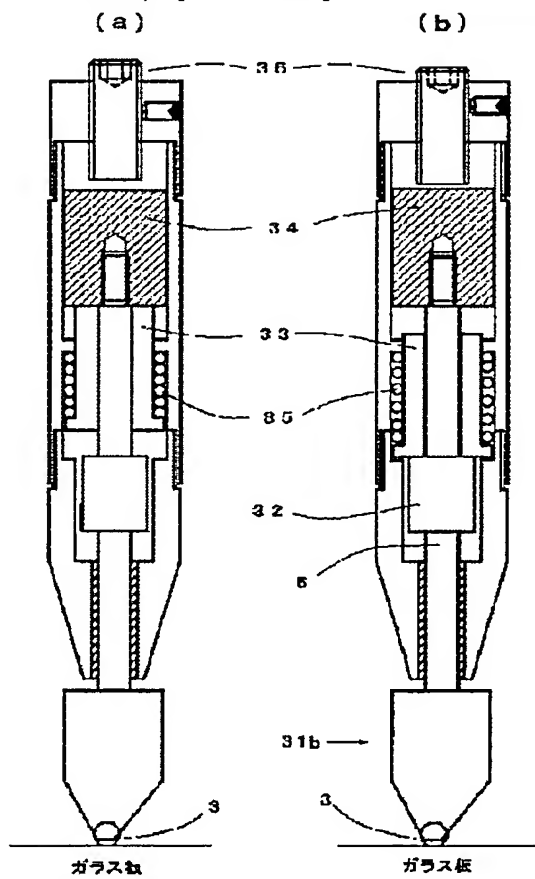


[Drawing 14]

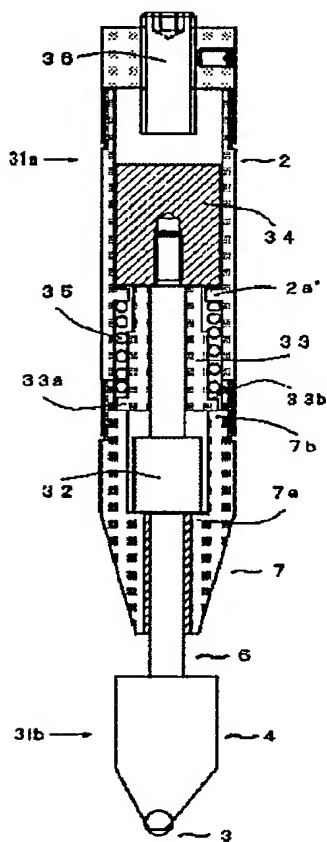
90



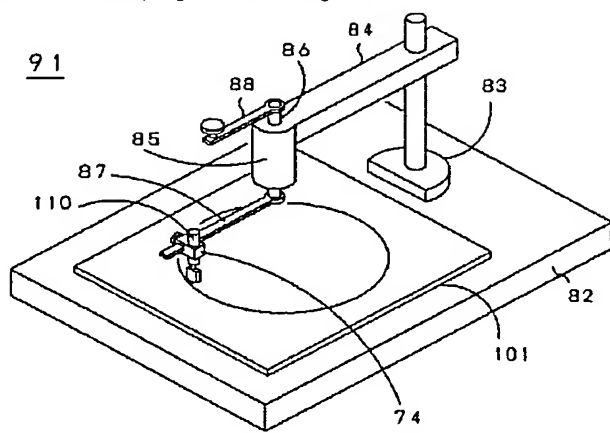
[Drawing 9]



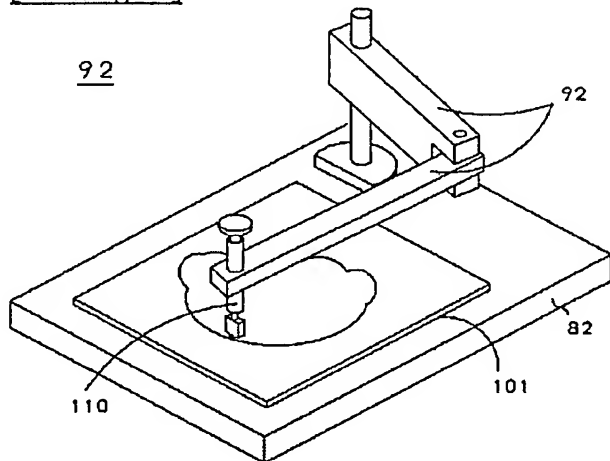
[Drawing 12]
61



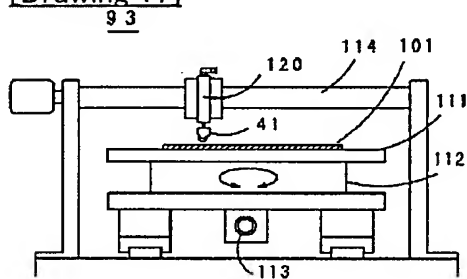
[Drawing 15]



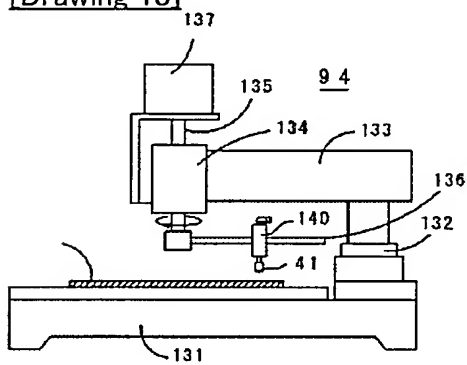
[Drawing 16]



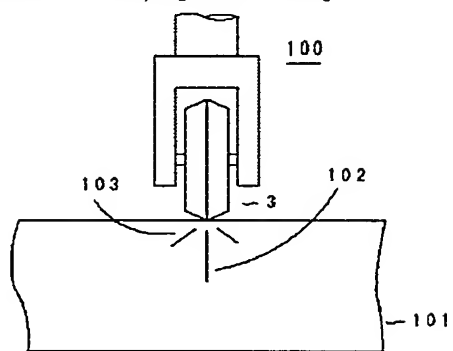
[Drawing 17]



[Drawing 18]



[Drawing 19]



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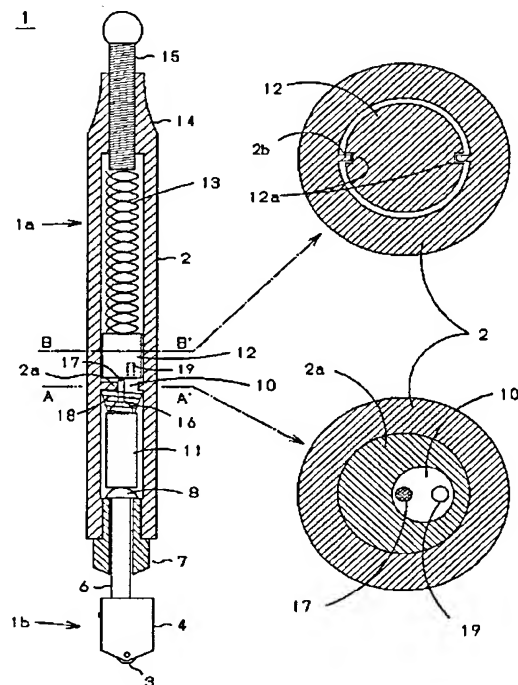
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(54)【発明の名称】 脆性材料切断用カッター、それを用いたスクライバー及びスクライブ方法

(57)【要約】

【課題】 スクライブ開始当初から適したスクライブ圧を設定するのが困難なため、スクライブ開始点で有効な垂直クラックが得られない。

【解決手段】 カッターヘッド部(1b)を上下動自在に保持し、かつ、コイルバネ(13)で下方に付勢しておき、前記コイルバネの付勢に抗してカッターヘッド部が所定量押し込まれたときにそのコイルバネの変形をトリガー機構(11, 12)により瞬時に解放するようにし、前記コイルバネの復元力で前記カッターヘッド部の刃(3)に衝撃力を伝える。



【特許請求の範囲】

【請求項 1】 脆性材料切断用の切刃（3）と、前記切刃を支持する支持軸（6）と前記支持軸を収納する筒部（2）とを具備するカッターにおいて、前記筒部は前記支持軸を前後に摺動可能に保持すること、前記筒部がトリガー発生手段と衝撃印加手段とをその内部に具備すること、を特徴とする脆性材料切断用カッター。

【請求項 2】 前記トリガー発生手段が弾性体（13）、凹部を有する重量物体（12）及び円錐形状体（16）とからなり、切断開始時に前記筒部を把持して前記切刃を被切断部材に押し付ける際に、前記支持軸が前記筒部内で所定量移動し、前記円錐形状体の一部が前記重量物体に設けられた前記凹部に嵌まり込むことにより動作すること、前記衝撃印加手段が前記重量物体からなり、前記トリガー発生手段が動作する際に前記重量物体が弾性体の作用により瞬時に初期位置に戻ることで前記支持軸を介して前記切刃に衝撃を伝達することを特徴とする請求項第 1 項記載の脆性材料切断用カッター。

【請求項 3】 前記トリガー発生手段が第 1 の吸引部材（33）、第 2 の吸引部材（34）及び第 1 の吸引部材の移動を抑制する弾性体（35）とからなり、切断開始時に前記切刃を被切断部材に押し付けるために前記筒部を把持して前記支持軸を摺動させた際に前記第 1 の吸引部材が第 2 の吸引部材から瞬時に離れることにより、動作すること、前記衝撃印加手段が係止手段（32）からなり、前記トリガー発生手段が動作する際に、前記第 1 の吸引部材が前記弾性体の作用により瞬時に初期位置に戻ることで前記支持軸を介して前記切刃に衝撃を伝達することを特徴とする請求項第 1 項記載の脆性材料切断用カッター。

【請求項 4】 前記筒部内にエア導入手段を設け、前記第 2 の吸引部材（34）にピストン機能をもたせ、所定のスクライプ圧をエア圧にて可変に設定することを特徴とする請求項 3 記載の脆性材料切断用カッター。

【請求項 5】 脆性材料基板を円形に繰り抜くサーキュラーにおいて、カッターヘッド（110）に請求項 1 乃至 3 のいずれかに記載の脆性材料切断用カッターを具備することを特徴とするスクライバー。

【請求項 6】 脆性材料基板をテーブル（82）の上に載置して、手回し用アーム（88）を 1 回転させて、前記脆性材料基板を円形に繰り抜く台丸切りにおいて、カッターヘッド（110）に請求項 1 乃至 3 のいずれかに記載の脆性材料切断用カッターを具備することを特徴とするスクライバー。

【請求項 7】 アーム（92）を関節機構とすることにより、脆性材料基板を自在な閉曲線の形に繰り抜く異形切り切断機において、カッターヘッド（110）に請求項 1 乃至 3 のいずれかに記載の脆性材料切断用カッターを具備することを特徴とするスクライバー。

【請求項 8】 テーブルに載置した脆性材料基板にたいして、カッターヘッドが相対的に X および Y 方向に移動する機構の自動ガラススクライバーにおいて、前記カッターヘッド（120）に請求項 4 記載の脆性材料切断用カッターを具備することを特徴とするスクライバー。

【請求項 9】 脆性材料基板をテーブル（131）の上に載置して、モータ（137）により回転アーム（136）を 1 回転させて、前記脆性材料基板を円形に繰り抜く自動円形スクライバーにおいて、カッターヘッド（140）に請求項 4 に記載の脆性材料切断用カッターを具備することを特徴とするスクライバー。

【請求項 10】 脆性材料切断用の切刃（3）と、前記切刃を支持する支持軸（6）と前記支持軸を収納する筒部（2）とを具備するカッターを用いるスクライプ方法において、前記筒部がその内部にトリガー発生手段と衝撃印加手段とを具備すること、切刃を被加工脆性材料に押圧し、前記筒部内で前記支持軸を摺動させて所定の移動量だけ移動させる際に、前記被加工脆性材料に印加するスクライプ圧を連続的に増加させていき、所定の移動量だけ移動した時点で所定のスクライプ圧が発生すると共に、前記トリガー手段が動作し、その動作により前記衝撃印加手段により切刃に所定の大きさの衝撃力が与えられ、その後引き続いて前記所定のスクライプ圧にてスクライプすることを特徴とする脆性材料のスクライプ方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、脆性材料を切断するために用いられるカッターに関し、特にガラスを切断するために用いられるカッターに関する。

【0002】

【従来の技術】まず、脆性材料の切断について、ガラスの場合を例に説明する。ガラスを切断する方法としては、以下のものが広く用いられている。即ち、ダイヤモンドのチップを有するダイヤモンドカッターや、超硬合金製のホイールカッターで、ガラス表面を引き掻き（スクライプという）、ガラス表面付近にクラックを発生させ、そのクラックに沿って曲げモーメントや衝撃力などを作用させて、ガラス内部深くクラックを成長させ、分断する方法である。

【0003】例えば、図 19 にホイール付きガラスカッター 100 でガラス板 101 にクラックを発生させたときの様子を示す。ガラス表面に、超硬合金製のホイール 3 を押し付けたとき、押し付け圧力がガラスの応力歪みの臨界値を超えると、圧力方向である板面に垂直方向にクラック 102 が生じる。これを垂直クラックという。この垂直クラックが成長してガラス板の反対側まで成長

して到達すると、ガラス板 101 は分断される。

【0004】押し付け圧力が大きい場合には、水平方向にも八の字状のクラック 103 が生じる。これを水平クラックという。水平クラックが発生すると、それが伸展することにより、押し付け圧力が相殺され、分断に重要な垂直クラックの伸展が阻害される。また、表面のガラスが剥がれて切り粉となってしまう。

【0005】従って、ガラスカッターでガラス表面をスクライプするとき、水平クラックが発生しないようにすることが重要である。

【0006】このスクライプに影響を及ぼす要因としては、代表的に以下のようなものがある。

(1) カッター：種類、材質、刃先角度、(ホイール径：ホイールカッターの場合)

(2) ガラス：表面付近の特性、ガラス組成、残留応力

(3) スクライプ条件：刃先荷重、スクライプ速度

(4) 環境：雰囲気温度と湿度、カッター油の有無

【0007】厚いガラス板を正確に分断するには、深い垂直クラックを得る必要がある。このためには、刃先角度を大きくし、刃先荷重を大きくするとよい。また、ホイールカッターの場合は、ホイール径を大きくすること

も有効である。

【0008】
【発明が解決しようとする課題】さて、ガラスカッターを手で持ってガラス表面をスクライプする際、スクライプ開始当初では刃先にかかる荷重が十分でないことが多い。このため、有効な垂直クラックを得られないことがしばしば生じる。この有効な垂直クラックの発生を伴わないスクライプ箇所を本明細書では「空切り部分」と呼ぶことにする。この空切り時には、垂直クラック発生に伴うスクライプ特有のチリチリ音は発生しない。

【0009】スクライプ開始点で有効な垂直クラックが得られていないと、例えばガラス板に曲げ応力を与えて分断するとき、この切り始めの部分が正確に分断できず、角(つの)と称されるガラスの分断残り箇所が発生するといった不具合があった。特に液晶表示パネルなどに用いられる極薄のガラス板に対してスクライプ開始点から有効な垂直クラックを得ることは困難であった。

【0010】本発明は、簡単な機構でスクライプ開始点から有効な垂直クラックを発生できる脆性材料切断用カッターを提供することを目的とする。また、そのカッターを用いたスクライパーとスクライプ開始時から有効な垂直クラックを発生してスクライプする方法を提供することも目的とする。

【0011】

【課題を解決するための手段】本発明の脆性切断用カッターは脆性材料切断用の切刃(3)と、前記切刃を支持する支持軸(6)と前記支持軸を収納する筒部(2)とを具備するカッターにおいて、前記筒部は前記支持軸を前後に摺動可能に保持すること、前記筒部がトリガー発

生手段と衝撃印加手段とをその内部に具備すること、を特徴とする。

【0012】そして、前記トリガー発生手段が弾性体(13)、凹部を有する重量物体(12)及び円錐形状体(16)とからなり、切断開始時に前記筒部を把持して前記切刃を被切断部材に押し付ける際に、前記支持軸が前記筒部内で所定量移動し、前記円錐形状体の一部が前記重量物体に設けられた前記凹部に嵌まり込むことにより動作すること、前記衝撃印加手段が前記重量物体からなり、前記トリガー発生手段が動作する際に前記重量物体が前記弾性体の作用により瞬時に初期位置に戻ることによって前記支持軸を介して前記切刃に衝撃を伝達することを特徴とする。

【0013】また、前記トリガー発生手段が第1の吸引部材(33)、第2の吸引部材(34)及び第1の吸引部材の移動を抑制する弾性体(35)とからなり、切断開始時に前記切刃を被切断部材に押し付けるために前記筒部を把持して前記支持軸を摺動させた際に前記第1の吸引部材が第2の吸引部材から瞬時に離れることにより、動作すること、前記衝撃印加手段に係止手段(32)からなり、前記トリガー発生手段が動作する際に、前記第1の吸引部材が前記弾性体の作用により瞬時に初期位置に戻ることによって前記支持軸を介して前記切刃に衝撃を伝達することを特徴とする。

【0014】さらに、前記筒部内にエアー導入手段を設け前記第2の吸引部材(34)にピストン機能をもたせ、所定のスクライプ圧をエアー圧にて可変に設定することを特徴とする。

【0015】上記のトリガー発生手段は円錐形状体(16)の一部が重量物体(12)の凹部に嵌まり込むこと、第1の吸引部材(33)と第2の吸引手段(34)が瞬時に離れること、第1の吸引部材(43)と第2の吸引部材が瞬時に離れること、のいずれかを用いる。

【0016】上記の衝撃印可手段は重量物体(12)または第1の吸引部材(33)が弾性体の作用により瞬時に初期値に戻ること、第1の係止部材(32)が第1の吸引部材(43)に衝突させること、のいずれかを用いる。

【0017】弾性体としてはコイルバネ、圧縮バネなどを主に用いるが、低硬度のゴム材や樹脂であってもよい。

【0018】

【発明の実施の形態】図1は、本発明の第1の実施形態を示したガラスカッター1の断面構造を示している。ガラスカッター1は、主に、筒体2よりなる本体部1aと、例えばタングステン合金からなるホイール3を保持部4に回転自在に取り付けたカッターヘッド部1bとからなる。保持部4に設けた軸6が、筒体2の下端に取り付けられた軸支持部7に挿通されることにより、カッターヘッド部1bは上下方向に摺動可能となっている。こ

の軸 6 は前記軸支持部 7 から抜け落ちないようにその上端にリベット状の頭部 8 を有する。

【0019】また、本発明では、後述するように、スクライブ時に、カッターヘッド部 1 b と共に軸 6 を上方向に所定量押し込むことにより、カッターヘッド部 1 b に衝撃力を与える構成となっているため、軸 6 は軸方向に所定量のストロークを持つ構造となっている。

【0020】把持部となる筒体 2 の中空部内には、その中空部を上下に 2 分するようにフランジ形状の係止部 2 a が形成されている。その係止部 2 a には、図 1 の A-A' ラインにて上向きに見た拡大断面図に示したように、中心からずれた位置に円形の窓 10 が形成されている。この係止部 2 a は実際には筒体 2 と一体的に形成される。

【0021】係止部 2 a の下中空部には、前記軸 6 の頭部 8 に当接してプッシュロッド 11 が納められ、係止部 2 a の上中空部には、衝撃力を発生させるために所定の重量を有するハンマー部 12、ハンマー部 12 を下方向に付勢させるためのコイルバネ 13 が納められている。本体部 1 a の頂部 14 には、ネジ 15 がネジ込まれており、このネジ 15 の下端がコイルバネ 13 の上端を押さえ付けている。従ってこのネジ 15 を回して上下動させることにより、コイルバネ 13 の付勢力を調整できる。

【0022】前記プッシュロッド 11 は、その外径を、筒体 2 下部の中空部の内径よりも数ミリ程度小さくしておくことにより、その中空部内で遊嵌状態に位置する。そして、プッシュロッド 11 の上端部には、円錐体 16 が形成され、更にその円錐体 16 の先端部には細い柱状体 17 が形成されている。前記円錐体 16 での底部での外径はプッシュロッド 11 の外径よりも小さく、これにより、プッシュロッド 11 上面に生じた肩部と、係止部 2 a との間に円錐台形状のコイルバネ 18 が設けられている。このコイルバネ 18 により、プッシュロッド 11 を下方に付勢すると共に、前記柱状体 17 を待機時に中空部の中心軸に合致させる。

【0023】上記ハンマー部 12 の下面には、その中心からずれた(図中右方向の)位置に、上方に向かう孔 19 が形成されている。この孔 19 の径は、プッシュロッド 11 の柱状体 17 の径よりも多少大き目になっている。A-A' ラインでの拡大断面図において、係止部 2 a の窓 10 は、前記孔 19 およびプッシュロッド 11 の柱状体 17 を含むように位置する。

【0024】又、ハンマー部 12 には、B-B' ラインでの拡大断面図に示すように、一対の溝 12 a が軸方向に形成されており、それらの溝 12 a に係合するように、筒体 2 の内周面に突起 2 b が軸方向に形成されている。これにより、ハンマー部 12 は上下動の際には周方向の回転が規制される。なお、コイルバネ 13 と 18 の代わりとして、同等の機能が得られるものであれば他の弾性体であってもよい。

【0025】以上述べた本カッター 1 の動作を図 2 の要部拡大断面図に従って説明する。(a)図は待機時の場合で図 1 と同じ状態である。次に、把持した本体部 1 a を下方に押し付けてホイール 3 をガラス板に押し付けると、コイルバネ 13 の付勢力に抗してプッシュロッド 11 が上昇する。そのプッシュロッド 11 の円錐体 16 の表面が係止部 2 a に突き当たるようになると、その後は、(b)図のごとく、プッシュロッド 11 自体が時計方向に向きを変えながら上昇する。

【0026】(c)図は、その円錐体 16 の頂部に位置する柱状体 17 が、ハンマー部 12 の下面に形成した孔 19 に合致したところを示しており、この後は、(d)図に示すように、ハンマー部 12 は瞬時に降下し、その孔 19 の面 Z が柱状体 17 の上端面に衝突する。このとき発生した下方向の衝撃力は、プッシュロッド 11 および軸 6 を通じてカッターヘッド部 1 b のホイール 3 に伝わる。

【0027】このように、衝撃力が発生するまで、カッターヘッド部 1 b をガラス板に押しつけ、この衝撃力の発生を確認した後は、通常の場合と同様にスクライブを行う。この衝撃力の発生に要した押し付け圧を、スクライブ開始点で必要とする切り込み圧としておけば、スクライブ開始点で最適な切り込み圧を印加できる。

【0028】また、切り込み圧を加えている状態でホイール 3 を通じてガラス板へ衝撃力が与えられるため、垂直クラックの成長が更に促進され深い垂直クラックが得られる。

【0029】本ガラスカッター 1 で形成された垂直クラックを模式的に示したのが図 3 である。スクライブ開始点からガラス板 101 に有効な垂直クラック C が形成されている。これに対し、従来のガラスカッター 100 により形成される垂直クラック C は図 4 に示すように、スクライブ開始点初期で空切り部分 V が存在していることがわかる。

【0030】図 1 のガラスカッター 1 では、トリガー機構として、プッシュロッド 11 先端の柱状体 17 がハンマー部 12 の孔 19 に嵌り込む構成としたが、図 5 に示した別のトリガー機構では、ハンマー部 12' に 2 段構成の孔 19' を形成したことにより、コイルバネ 13 の復元を 2 回に別け、衝撃力を 2 回発生できる。

【0031】図 6 にカッターヘッド部 1 b の一つの例の断面図を示した。軸 6 の内部に綿芯 25 が挿入されており、この綿芯 25 にはカッター油が含まれている。綿芯 25 の先端はホイール 3 に接触しており、カッター油を供給できるようになっている。

【0032】図 7 は、本発明の第 2 の実施形態を示したガラスカッター 1' を示している。図 1 のものでは、ハンマー部 12 の周方向の回転を規制するために、筒体 2 の内周面に突起 2 a とハンマー部 12 の外周に溝 12 a を形成したが、そのためには微細な加工が必要となる。

【0033】そこで、図7のガラスカッター1'では、ハンマー部12'の下面には、前記孔19に替えて、リング状の溝26を形成している。これにより、ハンマー部12'は周方向に回転していても、傾斜部21と係止部2aが当接していく際にプッシュロッド20が時計方向に傾いた時には、その柱状体22は溝26に必ず嵌り込む。

【0034】又、このガラスカッター1'では、軸6の頭部8'を平面とし、逆にプッシュロッド20の底部23をおわん状とし、待機時には自立するようにしたため、図1で採用したコイルバネ18を不要としている。

【0035】図8は本発明の第3の実施形態を示したガラスカッター31の断面構造を示しており、図1と対応する要素については共通の符号を付している。カッターヘッド部31bの保持部4より上方に延在する軸6には、途中にストッパー32が固定的に取り付けられ、更に、鉄製のボビン33が摺動自在に挿通され、この軸6の上端は磁石34の下面にねじ込まれている。

【0036】ストッパー32の下面は、軸支持部7の第1の肩部7aに当接し、ボビン33の下面は軸支持部7の第2の肩部7bに当接している。又、磁石34の下面は、筒体2の内周面に形成したフランジ状の係止部2aに当接している。そして、ボビン33の下端部に形成された径方向の突出部33aと前記係止部2aの下面との間にコイルバネ35が嵌め込まれている。また、上限ストッパー36は、磁石34の上方向の移動を規制するためのものである。

【0037】図8で示した待機時には、ボビン33がコイルバネ35により、下方向に付勢されており、磁石34に一体的に吸着していることにより、軸6およびカッターヘッド部31bも下方向に付勢されている。

【0038】次に図9の(a)図に示すように、ホイール3をガラス板に押しつけると、磁石34とボビン33が一体となって上方に移動し、このボビン33の移動によりコイルバネ35が圧縮される。その結果、このコイルバネ35の反作用により、ボビン33に下向きの力(つまり磁石34からボビン33を引き離す力)が作用する。

【0039】前記ホイール3を更にガラス板に押しつけていくと、磁石34の移動量に比例してコイルバネ35の反発力が增大する。その反発力が磁石34とボビン33間の吸引力を上回ると、(b)図のごとく、ボビン33のみがコイルバネ35の付勢力により瞬時に下降し、ストッパー32の上面を叩きつける。これにより、軸6を通じてカッターヘッド部31bのホイール3に下向きの衝撃力が加わり、前実施形態と同じ作用効果が得られる。

【0040】磁石34の径の長さを変えたりか磁性材料を変えたりとかして磁力を変えたり、コイルバネ35のバネ係数を変えたり、長さを変えることにより、カッター

ヘッド部31bの所望の押し込み量で磁石34とボビン33とを切り離すことができる。又、衝撃力を変えるにはボビン33の質量を変えたり、ボビン33とストッパー32の距離を変えればよい。尚、磁石34を電磁石とすれば、ボビン33の切り離しのタイミングを随意に設定できる。又、電磁石への通電オフにより、ボビン33を切り離すようにしてもよい。

【0041】図10は、本発明の第4の実施形態を示したガラスカッター41の断面構造を示している。図8と異なるのは、上限ストッパー36'をパイプ構造とし、その上限ストッパー36を通じてエアーを筒体2の上部に導くようにしている。これにより、磁石34がピストンとして作用し、エアー圧を調整することによりホイール3に所望のスクライブ圧を設定できる。

【0042】図11は、本発明の第5の実施形態を示したガラスカッター51の断面構造を示している。図8と異なるのは、コップを逆さまにした筒体部材37でコイルバネ35の上端を押さえつけている。磁石34はこの筒体部材37と接触しないようにその径を小さくしており、かつ、筒体部材37が磁石34に吸着されないよう、非鉄材料で形成される。そしてその筒体部材37の上部には回しネジ38が取り付けられており、その回しネジ38を回すことにより、筒体部材37が上下してコイルバネ35の間隔を変更できるようになっている。この構成により、ボビン33の切り離しタイミングを随意に設定できる。

【0043】以上述べた第3～第5の実施形態では、磁石34の保持力に従って、ボビン33が切り離される構成であったが、コイルバネ35の経年変化や磁石34の吸着面の汚れなどにより、切り離しポイントが一定に保持されないかも知れない。この問題を解決するために図12にて、本発明の第6の実施形態のガラスカッター61を示している。

【0044】ボビン33の上部に対し、その径を小さくし、これによりボビン33に肩部33bを形成する。そして、係止部2a'の突出長さを図8の係止部2aよりも長い目にしている。これにより、カッターヘッド部31bの押し込みにより、磁石34とボビン33とが一体となって上昇するが、前記係止部2a'が前記肩部33bと当接すれば、これ以降はボビン33の上昇が拘束され、磁石34のみが移動する結果、磁石34からボビン33が切り離され、その後は図8のガラスカッター31と同様に、ボビン33の下面がストッパー32の上面を叩きつける。

【0045】図13は、本発明の第7の実施形態を示したガラスカッター61の断面構造を示している。筒体2の係止部2aに鉄製のリング部材43が固定され、その上部に位置する円盤状の磁石44は軸6と固定される。そして図8にあったコイルバネが省かれている。

【0046】(A)図は待機時の状態を示し、磁石44は

リング部材43に吸着している。この状態で筒体2を下方に押し込むと、磁石44とリング部材43との吸着が解除され、筒体2のみが下方へ降下して、軸6に固定されているストッパー32の上面に、筒体2の係止部2aの下面が衝突する。これにより、ホイール3に対し下方の衝撃力が加わる。尚、リング部材43を磁石とし、44を鉄材料としてもよく、あるいは双方を磁石としてもよい。

【0047】本発明の第1から第6の実施形態のガラスカッターの筒部2の内部には、図示されていないが、軸6の上方への移動を係止すると共に、カッターヘッド部1bを回転可能とする機構が内蔵されているが、詳細はここでは省略する。

【0048】以上述べたガラスカッター1、1'、31、51、61、71はいずれもその本体部を手で握ってスクライプするが、次に示すような装置に装着して使用することもできる。

【0049】図14は、ガラス板101を円形に繰り抜くサーキュラー90を示す。ガラス板101上に吸盤72を固定し、アーム73がその吸盤72を中心として回転可能に設けられ、かつ、その吸盤72部を支点として矢印方向に移動可能になっている。そのアーム73の端部にはカッターヘッド保持具74がアーム方向に移動自在に取り付けられている。そのカッターヘッド保持具74に、本発明のカッターヘッド110の本体部1aが取り付けられる。そしてそのカッターヘッド110の上部に対して握り部75が装着される。

【0050】その握り部75を手で握り、下方向に押し付けると、既述したようにトリガー発生手段が作用してホイール3に衝撃が加わるので、その後、その握り部75を円移動させて、ガラス板101をスクライプする。

【0051】図15はガラス板101を円形に繰り抜く台丸切り91を示す。テーブル82の端に固定台83が設けられ、この固定台83の支持柱の上端部からテーブル82の中心方向に延在する固定アーム84が取り付けられている。その固定アーム84の先端部には、上下方向の軸受け部85が取り付けられ、その軸受け部85に挿通された回転軸86の下端部から水平方向に延在する回転アーム87の先端部に、カッターヘッド110を固定したカッターヘッド保持具74が取り付けられている。又、前記回転軸86の上端には、手回し用のアーム88が取り付けられている。

【0052】この場合も手回し用のアーム88を下方向に押し付け、カッターヘッド110のホイールに衝撃を発生させてからその手回し用のアーム88を回してスクライプする。

【0053】図16は、自在な閉曲線でガラス板101を繰り抜く異形切り切断機92を示す。アーム92を関節機構とすることにより、アーム先端に取り付けたカッターヘッド110を随意的位置へ移動させることができ

る。

【0054】以上の各加工機ではカッターヘッド110に1、1'、31、51、61のいずれのガラスカッターを用いてもよい。

【0055】図17は一般的な自動ガラススクライバー93の正面図を示しており、ガラス板101を載置するテーブル111は、回転テーブル112により、水平方向に回転すると共に、ボールネジ113によりY方向

(図16中、紙面と垂直な方向)に移動可能であり、一方、下端に本願発明の脆性材料切断用カッター41を具備するカッターヘッド120はレール114に沿ってX方向(図16中、左右方向)に移動可能としたものである。スクライプ時、テーブル111を所定のピッチでY方向に移動させる毎に、カッターヘッド120をX方向に移動させることにより、ガラス板101はX方向にスクライプされ、この後、テーブル111を90°回転させた後、同じようにスクライプすれば、ガラス板101は今度はY方向にスクライプされる。

【0056】ここで示した自動ガラススクライバーは一例であって、カッターヘッド120が固定され、テーブル111がX方向およびY方向に移動するタイプや、テーブル111が固定され、カッターヘッド120がXおよびY方向に移動するタイプにも本願発明の脆性材料切断用カッターを適用できる。

【0057】図18はガラス板101を円形に繰り抜く自動円形スクライバー94を示しており、テーブル131の端に支柱132が設けられ、この支柱の上端部からテーブル131の中心方向に延在する固定アーム133が取り付けられている。その固定アーム133の先端部には、上下方向の軸受け部134が取り付けられ、その軸受け部134に挿通された回転軸135の下端部から水平方向に延在する回転アーム136の先端部に、本願発明の脆性材料切断用カッター41を具備するカッターヘッド140が取り付けられている。又、前記回転軸135の上端にはモータ137が接続されている。スクライプ時、回転軸135と回転アーム136およびモータ137が一体となって、ガラス板101に向かって下降することにより、カッターヘッド140も下降する。そして、モータ137によりカッターヘッドが1回転することにより、ガラス板101は円形にスクライプされる。

【0058】

【発明の効果】本発明の脆性材料切断カッターでは、カッターヘッド部を所定量押し込んだ時に、トリガー手段が作動し、その作動によりカッターヘッド部の刃先に衝撃力を印加することにより、スクライプ開始当初より脆性材料に有効な垂直クラックが形成され、空切りとよばれる現象をなくすことができた。

【図面の簡単な説明】

【図1】 本発明の第1の実施形態になるガラスカッタ

一の断面構造図

【図2】 図1のガラスカッターの動作を示した要部拡大断面図

【図3】 本発明のガラスカッターを用いてスクライブした時のガラス板の断面図

【図4】 従来のガラスカッターを用いてスクライブした時のガラス板の断面図

【図5】 図1のガラスカッターにおけるハンマー部の別の例を示した図

【図6】 図1のガラスカッターにおけるカッターヘッド部の構成例を示した詳細断面図 10

【図7】 本発明の第2の実施形態になるガラスカッターの断面構造図

【図8】 本発明の第3の実施形態になるガラスカッターの断面構造図

【図9】 図8のガラスカッターの動作を示した断面構造図

【図10】 本発明の第4の実施形態になるガラスカッターの断面構造図

【図11】 本発明の第5の実施形態になるガラスカッターの断面構造図 20

【図12】 本発明の第6の実施形態になるガラスカッターの断面構造図

【図13】 本発明の第7の実施形態になるガラスカッターの断面構造図

【図14】 サーキュラーの一例を示した斜視図

【図15】 台丸切りの一例を示した斜視図

【図16】 異形切りの一例を示した斜視図

【図17】 自動ガラススクライバーの正面図

【図18】 自動円形スクライバーの正面図 30

【図19】 スクライブ時にガラス板内部に生じるクラックの様子を示した図

【符号の説明】

1、1'、31、41、51、61、71 ガラスカッター *

* ター

1 a 本体部

1 b カッターヘッド部

2 筒体

2 a 係止部

2 b 突起

3 ホイール

4 保持部

6 軸

7 軸支持部

8 頭部

10 窓

11 プッシュロッド

12 ハンマー部

13 コイルバネ

14 頂部

15 ネジ

16 円錐体

17 柱状体

18 コイルバネ

19 孔

20 プッシュロッド

26 溝

32 ストップパー

33 ボビン

34 磁石

33 a 突出部

35 コイルバネ

36 上限ストップパー

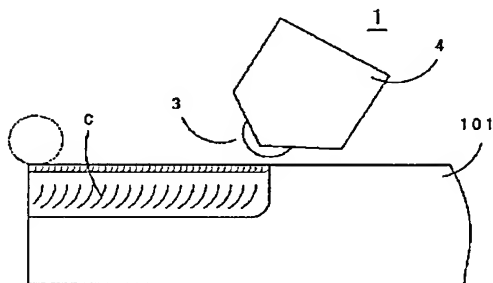
37 筒体部材

38 回しネジ

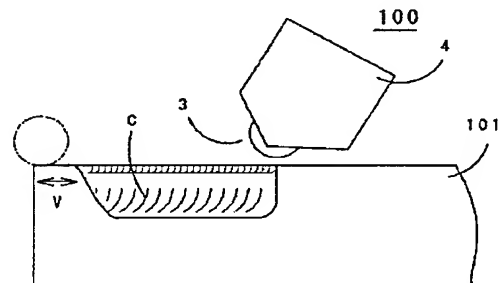
43 リング部材

44 磁石

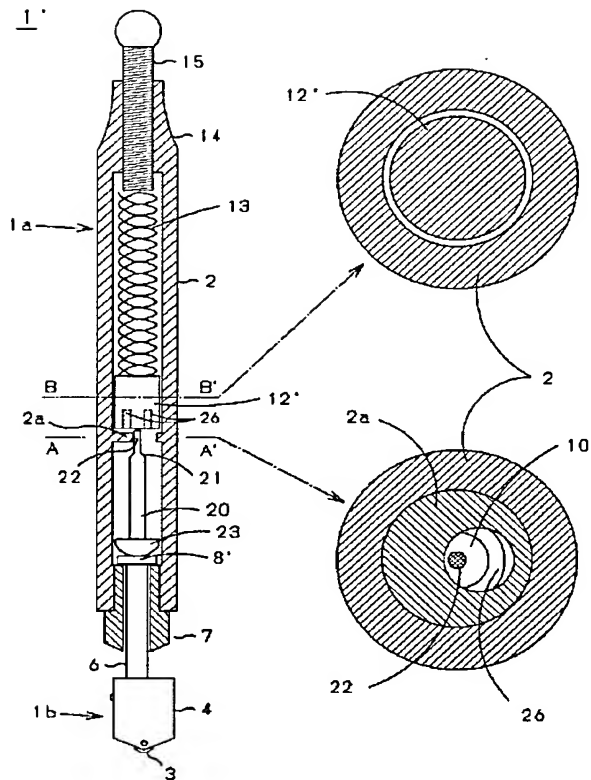
【図3】



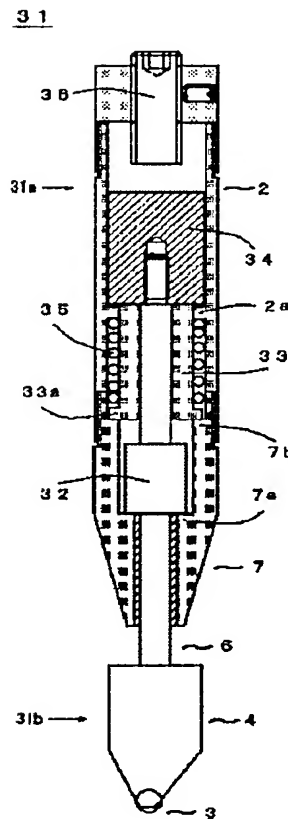
【図4】



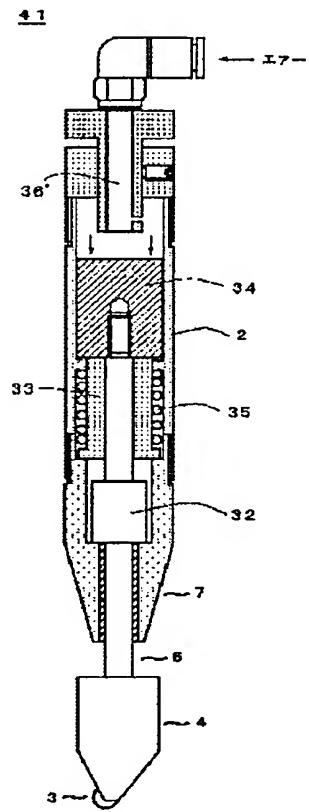
【図7】



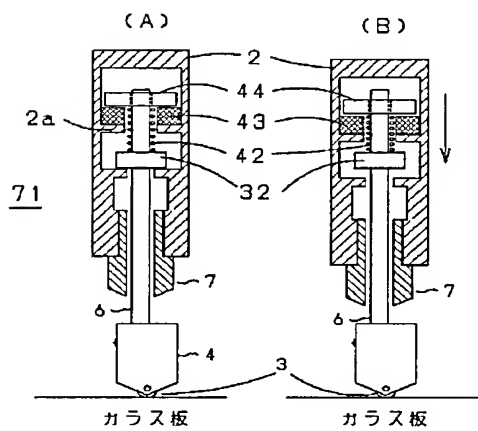
【図8】



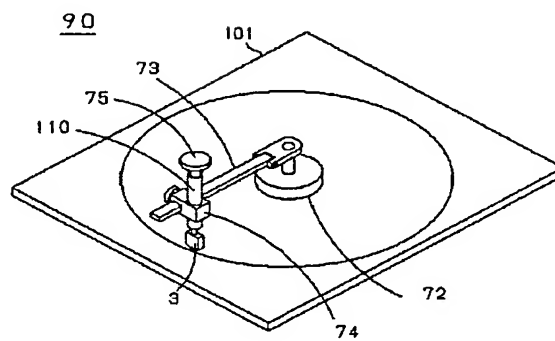
【図10】



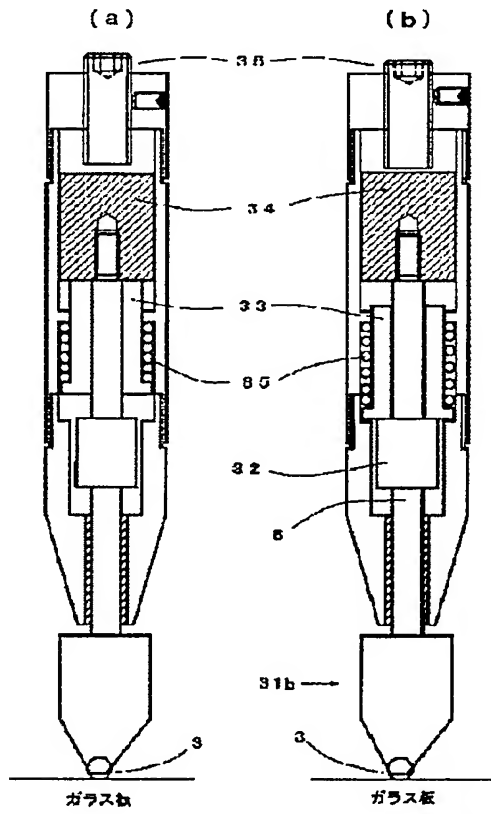
【図13】



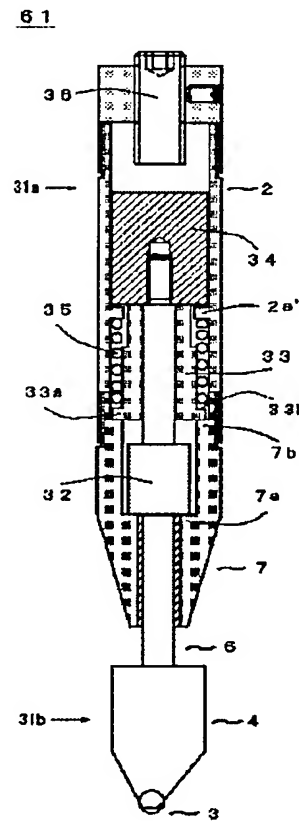
【図14】



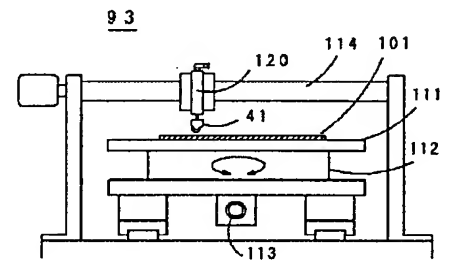
【図9】



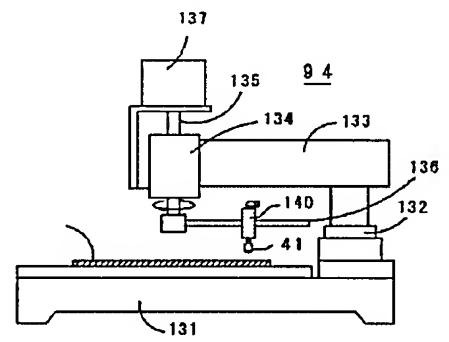
【図12】



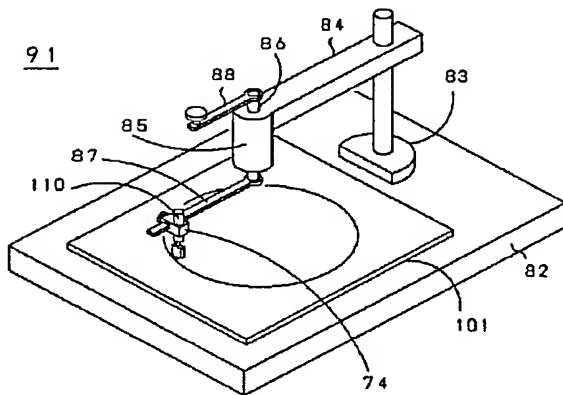
【図17】



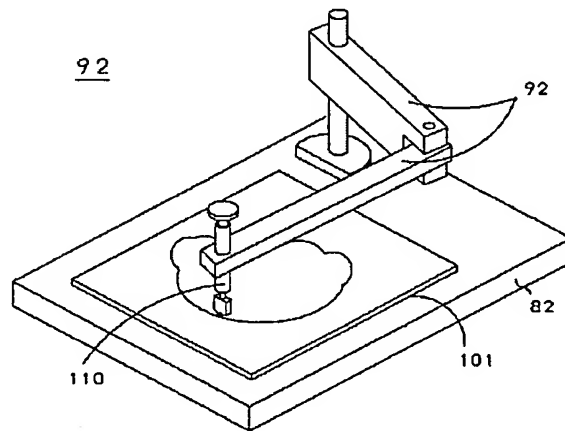
【図18】



【図15】



【図16】



F ターム(参考) 3C069 AA03 AA05 BA04 BA10 BB01
BC04 CA11 EA01
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